FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

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Founder and Editor: STANLEY SPOONER

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1930

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- Feb. 27 .... **"Latest Developments of Aero Engines." Lecture by Mr. A. J. Rowledge before R.Ae.S.**
- Mar. 1 .... **Model Aircraft Club display, Wimbledon Common.**
- Mar. 4 .... **"Winged Flight." By Mr. J. D. Batten, before S.M.A.E.**
- Mar. 5 .... **"Air Co-Operation with Mechanised Forces." Lecture by Wing-Com. T. L. Leigh-Mallory before Royal United Service Institute.**
- Mar. 6 .... **"Resistance of Air-Cooled Engines and the Townend Ring." Lecture by Maj. F. M. Green and Mr. H. C. H. Townend before R.Ae.S.**
- Mar. 10 .... **"Air Transport." Lecture by Herr M. Wronsky before R.Ae.S.**
- Mar. 22 .... **Inter-Services Rugby. R.A.F. v. Army at Twickenham.**
- Mar. 26 .... **Royal Aero Club Annual General Meeting.**
- Mar. 27 .... **British Gliding Association Inaugural Meeting.**
- April 3 .... **"Operation of the Aero-Postale Service in Europe." Lecture by M. P. Grimault before R.Ae.S.**

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The Index for Vol. XXI of "Flight" (January to December, 1929) is now ready, and can be obtained from the Publishers, 36, Great Queen Street, Kingsway, W.C.2. Price 1s. per copy (1s. 1d. post free).

EDITORIAL COMMENT

IN a recent speech about the Naval Conference, Sir Samuel Hoare made an appeal for the abolition or restriction of what he called "fighting forces and fighting material that are not needed primarily for defensive purposes, and that are fundamentally of an aggressive character." He gave three examples, namely, the submarine, the aircraft carrier, and the bomber aeroplane. We admit that these examples are somewhat puzzling to us.

Offence and Defence

We should not presume to be didactic about the submarine. A cobbler should stick to his last, and marine warfare is not a subject on which FLIGHT makes any claim to be an authority. We are willing to accept a recent statement of the First Lord of the Admiralty to the effect that in the war an attempt was made to use submarines to defend our harbours, and that the attempt was not a success. In common with the great majority of British people, we should like to see submarines abolished.

Aircraft carriers and bomber aeroplanes, however, have a living interest for all who study aircraft in peace and war. We admit that we do not find it easy to follow the line of argument which treats ordinary men-of-war as weapons of defence but regards carriers as weapons of offence. The ordinary surface ship, whether battleship or cruiser or destroyer, is a moving platform for missile weapons, namely, guns and torpedoes. The carrier transports aircraft which play a part similar to the gun and the torpedo tube. An aircraft bomb differs from a shell fired from a gun in details but not in essentials. The aircraft are the means by which bombs and torpedoes are moved from the ship towards the target. The advantage claimed for the aircraft is that they lengthen the

range. Whether the missiles from the carrier or from the cruiser are the more accurate or the more destructive is another issue. It is, likewise, a separate question whether a carrier is usually an asset or an embarrassment to a fleet. The point which we wish to make is that the missiles carried on both classes of ship are to be used for the same purpose. Nor need the point be obscured by the presence of fleet-spotters and fighters on the carrier. They are only ancillary to the main object of destroying the *matériel* and the *personnel* of the enemy. This destruction is wrought by shell and torpedo, and the question of offence or defence is not affected by the means used to convey the missile to the target.

Let us take a concrete example. Let us imagine some outlying part of the Empire, such as New Zealand, to be threatened by a hostile fleet, which perhaps is escorting transports. To strike at that fleet while it was still at a distance from the shores of the Dominion would certainly be a defensive measure. Circumstances might limit the choice of weapons for striking the blow. If a choice were possible, then it would be for tacticians to decide whether to use ships carrying guns or ships carrying aircraft. We cannot see that the use of the former should be classed as defensive and the use of the latter as offensive.

It may be that time will show that aircraft carriers are not the most effective means of destroying the enemy. In that case, they will naturally drop out of use. Sir Samuel Hoare said that the "eyes of the fleet" are the limited number of small machines which can be carried on battleships and cruisers. That may possibly turn out to be correct; but to prove carriers to be useless is not quite the same thing as to deny their potentialities for defensive warfare.

As regards bomber aeroplanes, for some years past the Air Ministry has consistently preached the doctrine that "attack is the best defence." On that principle has been explained the preponderance of bomber squadrons over fighter squadrons in the expansion programme of Air Defences of Great Britain. We have always understood that on the outbreak of a war the initial duty of the bomber squadrons would be to attack hostile aerodromes so as to prevent enemy aircraft from bombing Great Britain—an excellent example of the offensive-defensive. But we realise that Sir Samuel Hoare had rather in mind the possibility of bombers being used to attack civil populations. Everyone who wishes to limit the horrors of war wants to prevent that from happening. As Mr. Spaight has pointed out, a sensibly framed rule is usually respected by all belligerents, whereas a rule which attempts to forbid too much will soon become a dead letter. It would be futile to forbid the bombing of munitions of war, whether in dumps in the field or in factories in towns. Such bombing is one of the primary duties of any air force. To forbid the construction of specialised bomber aircraft would, as a matter of fact, enhance the military value of civil air liners. The object of international law should be to prevent barbarities, such as the use of gas, and the practice of "frightfulness" on the civil population, but not to restrict the legitimate activities of armed forces.

There is, in truth, little profit in discussing what is offensive or defensive unless one first defines those terms. If "A" wants to deprive "B" of territory and declares war, but when the armies engage it is "B" which invades "A" country—which of the two is fighting an offensive war? What makes a war offensive or defensive is the cause for which it is fought. From that point of view it matters not at all whether a certain engagement is an attack or a defence. It is, therefore, misleading to label any weapon as solely offensive.

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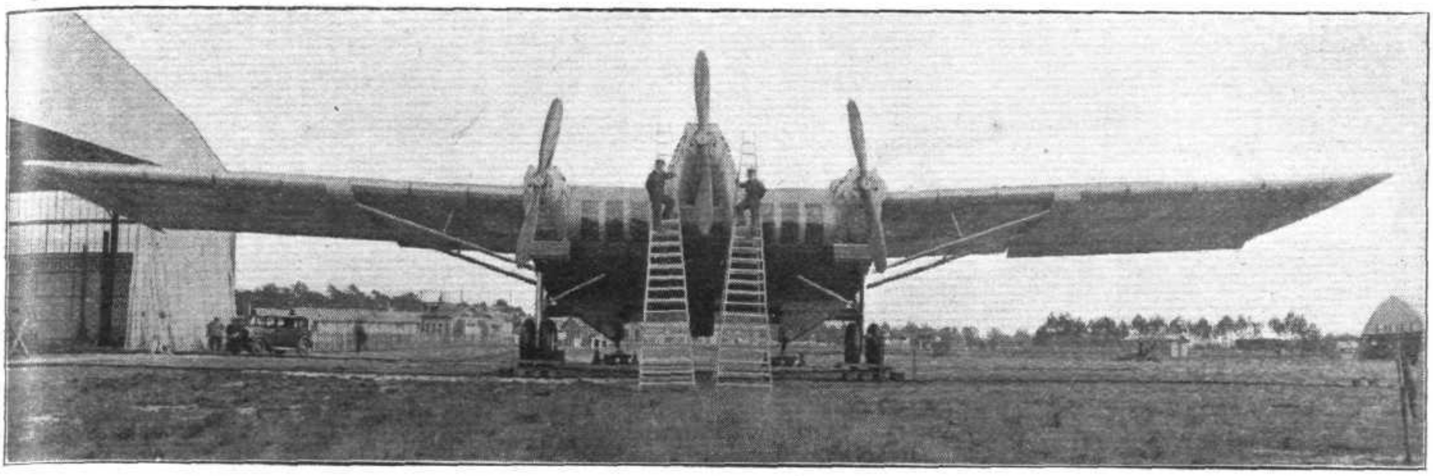
The Do. X

At the risk of tiring our readers, we are publishing this week a lengthy illustrated description of the Dornier Do. X "Flying Ship." We have illustrated the machine before, and we have commented Editorially upon it from such data as have been available from time to time. Now, however, we have received from the Dornier company authentic particulars, and thus it has become possible, for the first time, to discuss this highly interesting machine on a reliable basis.

The constructional features employed are fairly normal in so far as forms and methods of construction are concerned. It may be said that nothing which had not stood the test of time and experience has been incorporated in the construction. Aerodynamically, the design differs from previous Dornier boats only in the addition of the auxiliary wing which joins together the six engine supports, and this wing is a structural rather than an aerodynamic feature.

What, then, are the conclusions which one may draw from an examination of the data given? To begin with, the tare weight of the machine (equipped) is 66,000 lbs., and the normal gross weight at time of taking off is some 101,000 lbs. A very ingenious and interesting chart has been issued by the Dornier company, which shows the range and pay load of the machine. This chart is based upon still air conditions and a take-off gross weight of 45 metric tons (100,000 lbs.). In other words, no petrol reserve for adverse winds is included. Under those conditions the maximum range without any pay load, using all available lift for fuel, is approximately 2,200 km. (1,365 miles). At the other end of the scale, *i.e.*, with no range, the total disposable load is about 13,400 kg. (29,400 lbs.). Assuming a normal maximum power output of 6,000 h.p., the disposable load represents about 5 lb./h.p.

Perhaps the best indication of what the Do. X represents is to be found by examining the pay load for a relatively short range such as the London-Paris route. (Not that one would use the machine on this route, but it is one with which we are all familiar.) The distance is approximately 250 miles, and it is found that for such a distance, and without fuel reserve, the Do. X would carry some 24,000 lbs. pay load, which corresponds to a pay load of about 4 lb./h.p. This compares quite well with the pay loads of British machines used on the London-Paris service, but it should be observed that in order to get this pay load, the Dornier engineers have been obliged to go to a power loading of about 16¾ lb./h.p. and a wing loading of 19 lb./sq. ft. Our machines have very much lower loadings, which is merely another way of saying that they have a greater speed range, a better climb, and a greater power reserve. The sacrifice of these qualities, therefore, appears to be the price which Herr Dornier has had to pay for *size*. Whether the price is too high time alone can show. We must await the results of practical experience with the machine on a regular air route.



THE "DB 70"

A New French Commercial Monoplane

CONSTRUCTED entirely of duralumin and equipped with three 600-h.p. Hispano-Suiza Motors, fitted with reduction gears, the new French monoplane "DB 70" presents many interesting features. It is the first to appear of the new French transport machines of the 1930 design, and is one of the largest that have been constructed up to date.

It is designed to accommodate 28 passengers for day operation and 24 for night flying. The greater part of the passenger accommodation is situated in a large centre section, between the thick main wings, and is actually an enlarged wing in itself, contributing a considerable amount to the lifting surface of the machine.

In fact, the D.B. 70 resembles a combination of the American Burnelli "aerofoil-fuselage," and the Junkers G. 38 "all-in-wing" types—both of which have been described in FLIGHT. An important difference in the case of the DB 70, however, is that it has two fuselages "growing" out of the sides (or outer extremities) of the centre section, which carry the tail plane.

The three engines are located on this centre section, one centrally and the other two on "extensions" of the fuselages—all three being easily accessible during flight by means of a passage situated in the leading edge of the centre section.

The pilots' cockpit—with two seats side by side and dual control—is situated behind the central engine above the leading edge of the centre section.

Recent preliminary trial flights at the Merignac Aerodrome gave very satisfactory results, the machine taking off with a load of 5 tons after a preliminary run of only 400 ft.

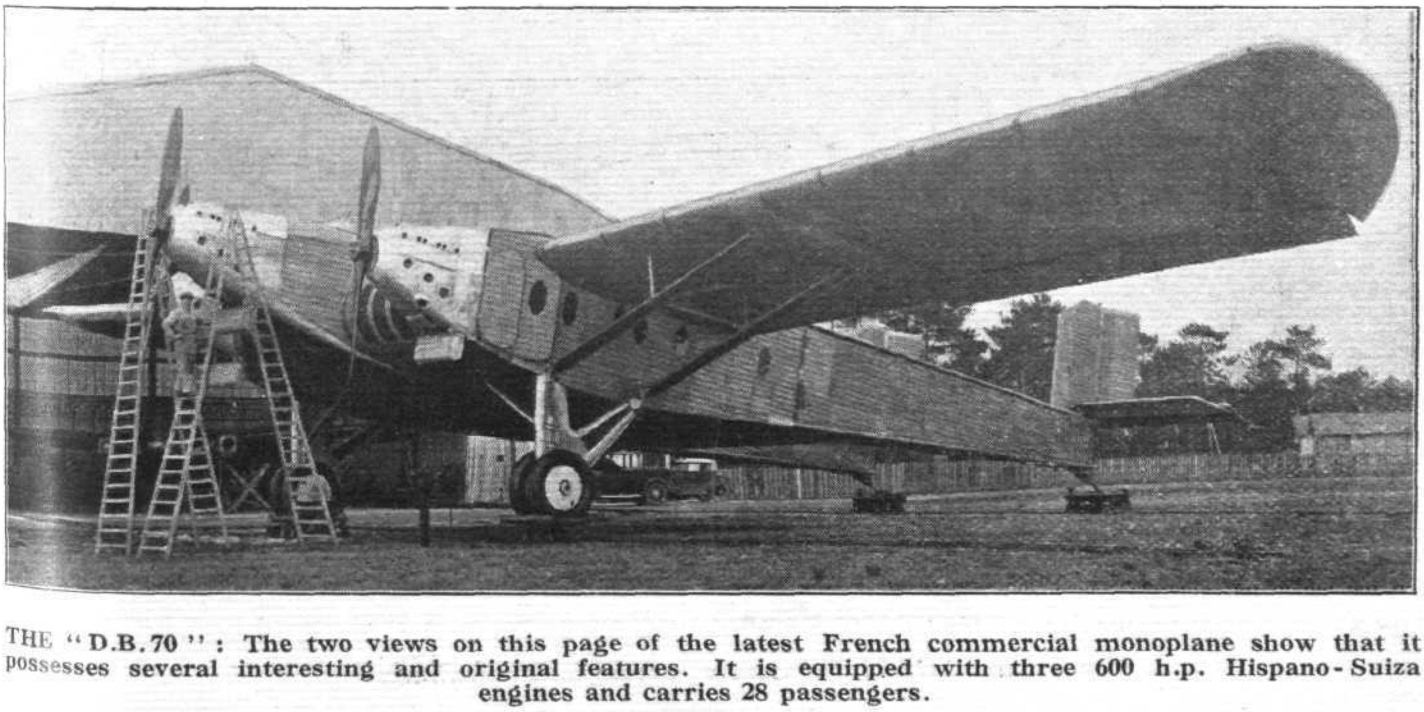
Centre Section

The DB 70 is constructed with a centre section between its main wings, which is of the extra thick wing type, and to which the main wings are attached on either side. Like all the rest of the 'plane, it is constructed entirely of duralumin, and the bolts and the fastenings are made of highly-tempered steel. It has a biconvex profile, and is unsymmetrical in shape. The framework consists of four main spars running parallel to the wings, and braced by cross and intersecting ribs. The spars in the wings and their struts, together with the motor supports, the fuselages and the landing chassis are bolted on to this centre section.

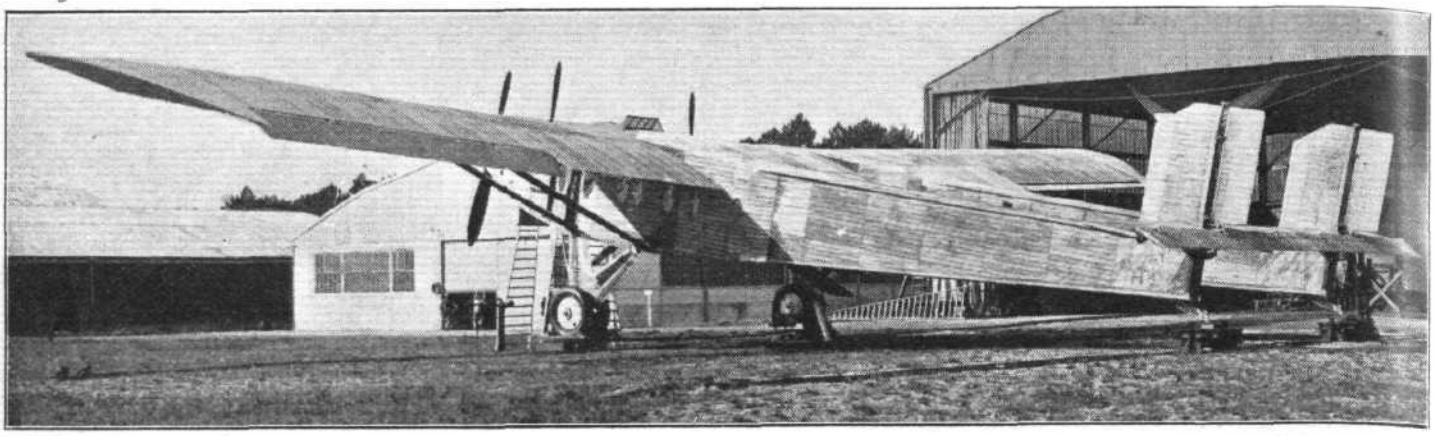
Passenger Accommodation

As previously stated, the passengers' quarters are situated in the centre section. They consist of two cabins, on each side of a large central saloon. There are also a lavatory, a W.C. and a kitchen behind the saloon. The cabins and the saloons together have 2,050 cubic ft. of space (58 cubic m.) and a floor space of more than 315 sq. ft. (30 sq. m.), with a height of 6 ft. 2 in. Each cabin occupies a bay or section of the centre section, and extends out into the first bay of the corresponding fuselage, which is joined to the rear end of the centre section (*see* diagram). Each cabin has a width of 5 ft. 10 in. and a length of 17 ft. 5 in.

For day flying the DB 70 will be equipped to carry 28



THE "D.B. 70": The two views on this page of the latest French commercial monoplane show that it possesses several interesting and original features. It is equipped with three 600 h.p. Hispano-Suiza engines and carries 28 passengers.

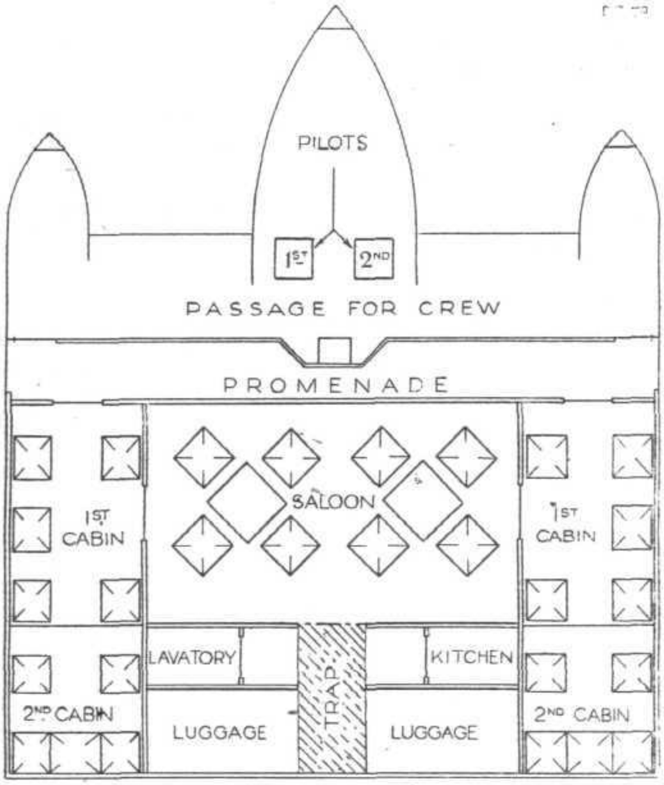


A THREE-QUARTER REAR VIEW OF THE "DB 70": The passengers' cabin is formed by the aerofoil-shaped centre section.

passengers, 10 in each cabin and 8 in saloon. For night operation there will be accommodation for 24 passengers. There will be 16 berths in the two cabins and 8 passengers will have large arm chairs in which to sleep in the saloon. Good-sized windows will be fitted on the lateral sides of the centre section and of the fuselages, and there will also be transparent floor lights installed on the lower side of the centre section, which forms the floor of the saloon and the cabins.

Wings

The wings have a uniform depth and profile, with a flat intrados (lower side). They are of simple construction and easily mounted. They have been mounted with a three dihedral angle, so as to assure a good stability. Each wing is attached to the side of the centre section, and is braced at its centre by a streamlined strut, the lower end of which is attached in turn to the lower side of the centre section. They are covered with duralumin sheet.



A plan of the cabin arrangement of the "DB 70" commercial monoplane.

Fuselage

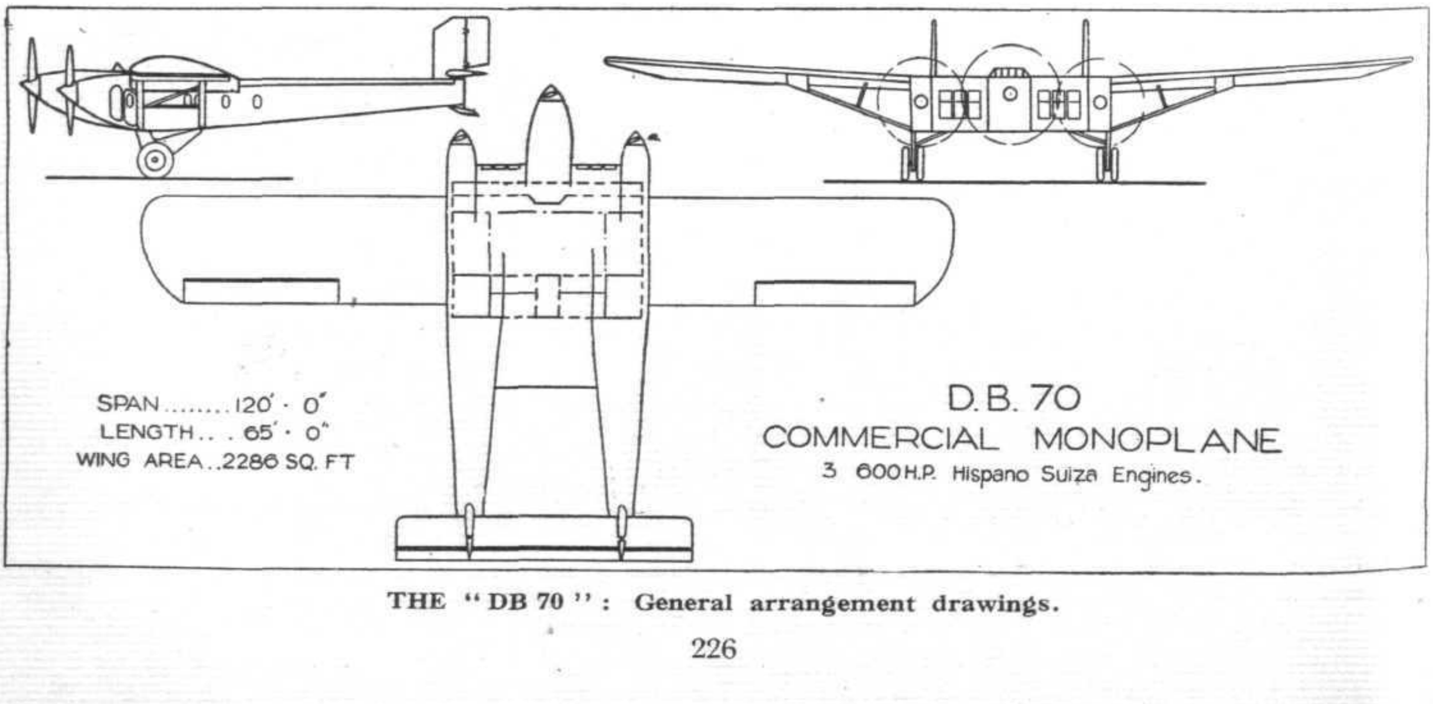
The framework of the fuselage is constructed with four longerons, which are braced with vertical and transversal ribs. This framework is covered with duralumin sheet.

Empennage

The horizontal stabiliser is equipped with compensated elevators. The two fuselages being so far apart permits of a wide (long) empennage. The fixed horizontal portion of the empennage is adjustable. There are two vertical directional rudders, each mounted in line with its respective fuselage. Each rudder consists of a fixed portion and a compensated movable surface.

Landing Chassis

The landing chassis is of the split-axle type, with a track between the two pairs of wheels, of 21 ft. 10 in. It is composed of two sets of two wheels each, 1,300 by 275 mm. dimensions, mounted in line with the axes of their respective fuselages. Each



THE "DB 70": General arrangement drawings.

pair of wheels is equipped with hydro-pneumatic shock absorbers.

Power Plant

The DB 70 is equipped with three 600 h.p. Hispano-Suiza, water-cooled motors, fitted with reduction gears of the same type as used by Dieudonne Costes in making his recent record flights. They drive tractor airscrews, and are mounted well forward of the centre section, so as to give the greatest efficiency possible. The fuel tanks are installed in the wings.

A passageway has been constructed in the leading edge of the centre section, which permits a mechanic to have constant access to the motors, while in flight. The motors are completely separated from the cabins by a fireproof partition, and also by a second partition designed to absorb their noise.

The Pilot's and Navigator's Seats

These seats are situated side by side, and equipped with dual controls, which can be connected or released at will. The visibility is exceedingly good, and the pilot can easily communicate with his navigator or mechanic. The plane is equipped with a radio set, and all the instruments necessary for night flying.

This DB 70 plane has been constructed at Bordeaux by the Société Aerienne Bordelaise in conjunction with the Nieuport Astra Co. and the help of Bordeaux capital. Preliminary trial flights are now being made, and the plane will soon be submitted to the Service Technique for its regulation tests, which are required before it can be put in passenger service.

The principal characteristics of the DB 70 are as follows:—

Span	120 ft. (37 m.).
Overall length ..	65 ft. (20 m.).
Height	19½ ft. (6 m.).
Wing surface ..	2,286 sq. ft. (218 sq. m.)
Weight empty ..	16,720 lb. (7,600 kg.).
Weight of fuel ..	4,400 lb. (2,000 kg.).
Weight of crew and fittings	1,100lb. (500 kg.).
Useful load	6,400 lb. (2,900 kg.).
Total weight ..	28,620 lb. (13,000 kg.).
Maximum ground speed	125 m.p.h. (200 km.).
Cruising speed at 1,000 m. (3,200 ft.) ..	112 m.p.h. (200 km.).
Flight radius (5½ hrs.' flight)	625 miles.
Ceiling	4,500 m. (15,000 ft.).

R. C. W.

LLOYD'S REGISTER AND AVIATION

A NEW note was struck at the 36th annual dinner of the Lloyd's Register Cricket Club, a function which serves as an annual dinner for Lloyd's as a whole, which was held at the May Fair Hotel on February 15, when aviation was for the first time given prominence and accepted as an established part of the Association's activities.

This was done not only by the aeronautical guests who were asked, but also by direct reference to the subject in the Chairman's speech and further by a very able speech on the part of Mr. Handley Page.

Among the guests present there were, Mr. Handley Page and Mr. John Lord from among our aircraft designers and manufacturers, Sir H. Segrave, who has recently been appointed technical adviser to the Aircraft Investment Corporation, Capt. S. G. Young, Capt. L. W. Warner, and Mr. J. J. A. Gilmore, all of the Aircraft Inspection Dept. of the Air Ministry. Mr. L. J. Hill, late of the A.I.D., is largely responsible for this interest in aviation on the part of the Association, as he has been throughout the moving spirit in getting them to start a department which will survey and assess aircraft in the same sort of way as they do for shipping. Mr. Hill has now a department which will survey aircraft for insurance purposes and has also been granted powers, under the Air Ministry, to undertake the inspection of privately-owned aircraft for the renewal of Certificates of Airworthiness. This power was originally vested in the B.A.I.G., the group who specialise in aviation insurance, but the Air Ministry have presumably considered that such inspection can be better carried out on the same lines as it is done with shipping and by the same association.

This is, of course, a move in the right direction, and before long we may hope to have commercial aviation run on much the same lines. There would then be an aeronautical equivalent of the Board of Trade which would control the safety factors and all other matters in which direct government control is desirable, while Lloyd's Register would do all the inspection and survey work. The world-wide name of the Association and the standards which they have set in their handling of shipping should be sufficient guarantee that the standard of British aircraft would be well maintained and the prestige already enjoyed by our aircraft all over the world would be in no way endangered, but might well be enhanced by association with the traditions of Lloyd's, as, indeed, was suggested by Mr. Handley Page.

At present there seems to be a somewhat anomalous position with regard to the machines which the Association may inspect for the renewal of their C. of A's. Private ownership constitutes the accepted qualification, but whether an owner of a commercial air-line may register the machines in his own name and thereby qualify for this service, and if not, then why not, does not seem clear. After all, one "B" licensed pilot might well buy and operate a large aircraft of his own and still remain a private owner.

However, this is a comparatively small point, which will undoubtedly be cleared up when the scheme is working properly, and it should not be long before A1. at Lloyd's will be considered as necessary a classification for aircraft as it is for shipping.

The Chairman, Mr. Andrew Scott, is to be congratulated on his foresight in establishing this new branch of his Association which we hope will in time become even more important than their shipping side.

DIRECTOR OF R.A.F. MEDICAL SERVICES

The Air Ministry announces:

Air Vice-Marshal David Munro, C.B., C.I.E., M.B., Ch.B., F.R.C.S. (Edin.), K.H.S., Director of Royal Air Force Medical Services, will be placed on the retired list, with effect from March 1, 1930.

Air Commodore John McIntyre, M.C., M.B., B.Ch., has been selected to succeed Air Vice-Marshal Munro as Director of Royal Air Force Medical Services, with effect from the same date.

Air Vice-Marshal Munro is taking up the appointment of Secretary to the Industrial Health Research Board under the Medical Research Council.

Air Vice-Marshal David Munro, C.B., C.I.E., M.B., Ch.B., F.R.C.S. (Edin.), K.H.S., entered the Indian Medical Service as a Lieutenant in 1902. During the war he served in France and the Middle East and besides being decorated with the C.I.E. was twice mentioned in despatches. In December, 1919, he relinquished his commission in the Indian Medical Service and was granted a permanent commission in the Royal Air Force Medical Service on taking over the duties of Principal Medical Officer, Headquarters, Royal Air Force, India. He was promoted to the rank of Air Commodore and appointed Director of Royal Air Force Medical Services in November, 1921, and has held this appointment since that date. He was made a Companion of the Order of the Bath in the New Year Honours List, 1924, and in the following year was promoted to the rank of Air Vice-Marshal and also appointed an Honorary Surgeon to His Majesty The King.

Air Commodore John McIntyre, M.C., M.B., Ch.B., joined the Royal Army Medical Corps as a Lieutenant in December, 1915, and for his services during the war was awarded the Military Cross. On the formation of the Royal Air Force in 1918, he was granted a temporary commission as Major and employed on medical staff duties at the Air Ministry. In August, 1919, he accepted a permanent commission in the Royal Air Force Medical Service and subsequently served as Principal Medical Officer to the R.A.F. commands in India and at Halton. He was promoted to the rank of Group Captain in July, 1927, and last year to the rank of Air Commodore.

PRIVATE FLYING
AND CLUB NEWS

THE AUTOMOBILE ASSOCIATION is launching a campaign for the establishment of National Parks, a committee for which has already been appointed by the Government, and the A.A. are suggesting that in addition, in view of the rapidly-growing number of private owners of aircraft, suitable level ground should be cleared to serve as landing grounds, with corrals guarded by shelter hedges, for the machines.

MR. HARRY KUCHINS, of St. Louis, U.S.A., has leased a tract of land near Creve Cour Lake, in St. Louis, to build the first glider port in the States. This land is a natural amphitheatre and gliding may be carried out at all times, regardless of the direction of the wind, as the 100-ft. high hills surround the whole tract. A club with fifty members has already been formed, and instruction on all types of gliders will be given.

W. B. DICK and CO., whose chairman, as we announced on January 31, has recently acquired a Gipsy-Moth, are now carrying out a 100-hour test on the engine, which is lubricated with their Ilo aero engine oil. This oil, as are all their lubricating oils, is blended from the finest Pennsylvanian crudes—for some of their oils European crudes are also used—and its characteristics are better than the minimums required by the Air Ministry. Their works at Rotherhithe are a hive of industry at the present time, with a constant stream of lorries taking away drums of oil. Their Moth, which is kept at Croydon is decorated with their standard colours, which are gold and dark blue, and is one of the prettiest we have ever seen.

For One who Practises What She Preaches: Mr. C. W. T. Wood, who has taken out a Coupé Gipsy Moth for the personal use of Mrs. Wilson, of Wilson air lines in Kenya. (FLIGHT *Photo.*)

THE LIVERPOOL AND DISTRICT AERO CLUB made 3,691 flights, totalling 1,428 hrs., during 1929, with only one forced landing, due to an ignition switch, and without any accidents. They have arranged a dance which should be extremely attractive, at the Adelphi Hotel, on Thursday, February 27, tickets 15*s*., can be obtained from the Secretary or any member.

THE LEICESTERSHIRE AERO CLUB have acquired a second Gipsy-Moth through the good agencies of Mr. H. C. S. Tyler, W. A. North, and T. T. Sawday, whose joint gift it is. The machine has been christened the "*Fernie*," following out the policy initiated when they christened their first machine the "*Quorn*." A further machine, a Moth III, has also been purchased by their President, Mr. Lindsay Everard, and will be used as an air-taxi by the club when not in use by its owner. F/O. S. Martin has taken up the duties of club instructor and made a start on Saturday, February 8. The membership of the club is now up to 255, which includes 10 "A" licensed pilots. The president is undoubtedly a "live" president, for now he is having 45 acres of his own land cleared and prepared as his own private aerodrome at Ratcliffe, and is allowing the club to use this for instruction, as well as their own. Leicester, it seems, will be well served in this matter, for Major G. Paget is allowing the use of a 40-acre field at Sulby Hall as a temporary landing ground, and there will therefore be landing grounds on the west, north and south sides of the county, and there are hopes of shortly obtaining permission to use a further ground on the east side. The first annual ball will be held on March 4, in the Grand Hotel, Leicester.

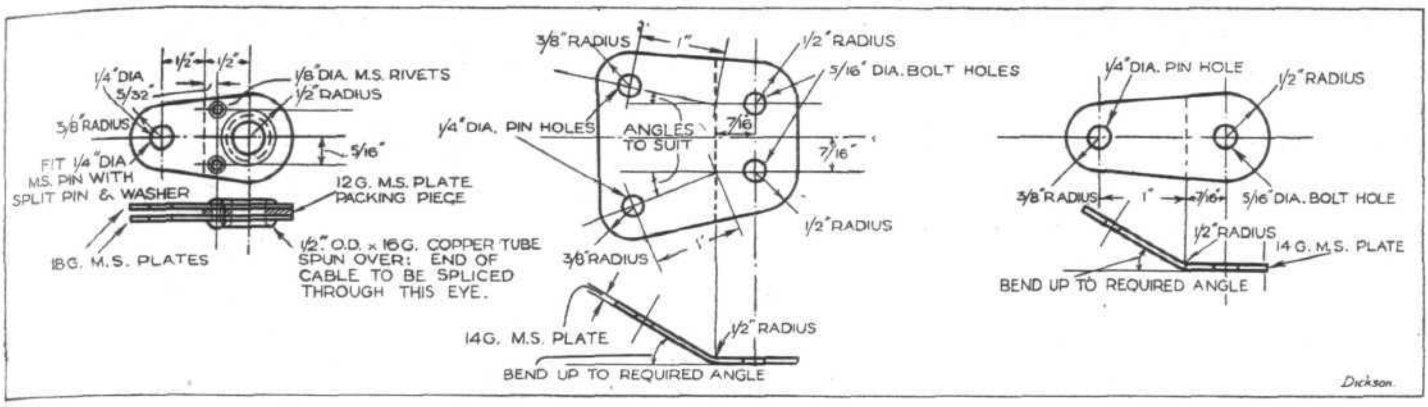
THE AIRCRAFT CLUB, HARROGATE, are progressing with the construction of their glider, and can already number several experienced pilots among their members who are keen to try their hand at gliding. One of their members makes visits to Germany, and through this means they are able to obtain first-hand news of the progress of gliding in that country, which is proving very helpful.

THE CINQUE PORTS FLYING CLUB report that Mr. Law, who recently returned after his attempt to fly to India, was forced to land in Greece, due to bad oil which he obtained at Naples; this was of no known brand, and was completely used up in seven hours, thereby causing his forced landing, which terminated his flight.

THE READING AIR PARK is going ahead by leaps and bounds (except when landing, we hope!) and since October 1 they have gained 16 "A" licences, and another nine pupils are "ready." The membership is now 221, with 92 under instruction; 5 owners already have their own aircraft. A second instructor, F./O. C. R. Cubitt has now started to assist Capt. Pennington.

THE PRINCE OF WALES' Moth G-AALG is specially finished in the dark red and dark blue colours of the Household Brigade. The upholstery is red leather. The registration letters are in red, outlined in white on the blue fuselage, and in plain red on the aluminium wings. Both cockpits are fitted with instruments, and the Prince uses the rear cockpit with dual control. A streamline head rest has been built behind the rear cockpit, and the luggage locker has been made especially deep. When the Prince returns from Africa, his machine will be kept at Windsor Great Park, adjacent to Fort Belvedere, the house which the Prince will then occupy.

THE LORD MAYOR OF LONDON is among those who have realised the advantage of air travel to enable them to do work the same day in two widely separated places. He is shortly going to France for a visit in connection with his office, and finds it necessary to be back in the north of this country on the same day. He has, therefore, chartered a Desoutter air-taxi from National Flying Services, and will travel in comfort from one appointment to the other without the loss of time inevitable with surface means of transport.



Fitting for connecting bracing wires to the wiring plates. 24 required per machine.

Double wiring plate. 3 off each hand required per machine.

Single wiring lug. 2 off each hand required per machine.

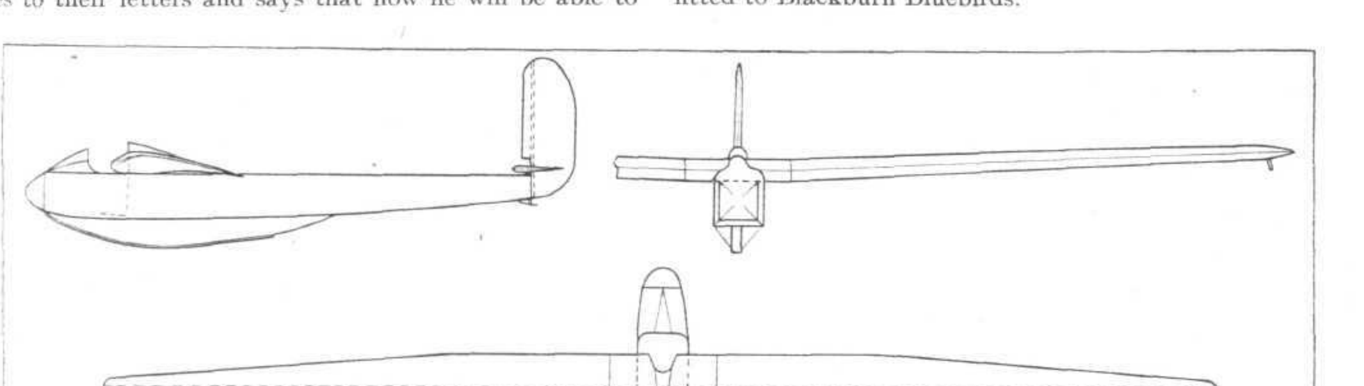
ABOVE we give details of a few more fittings for the Dickson glider. On the left is a fitting for connecting the bracing wires to the wiring plates and 24 are required per machine. All the bracing wires should be of 15-cwt. cable, with one 15-cwt. turnbuckle interposed, in each wire, at a convenient position. In the middle is the standard double wiring plate and one off each hand is required at the pylon top for the landing wires, one off each hand for the lift wires fitted under the seat, and one off each hand for the rear face of the rear spar at the outer supports to take the rear fuselage bracing wires. The single wiring lug is required for the bottom fittings at the rear of the fuselage to take the fuselage bracing wires and two off each hand are required. All fittings which have been bent must be sent to an aircraft manufacturer to be heat treated after bending. On the arrangement drawing of the aileron, shown with the main plane, a spruce strip should be shown running the full length of the aileron at a position $5\frac{1}{2}$ in. from the trailing edge. This strip is to be $\frac{1}{4}$-in. wide and 1-in. deep, inserted between the flanges of the ribs and pinned and glued in position.

BELOW is an interesting advanced type of machine which has been designed by Flt.-Lt. Latimer Needham, R.A.F. This is now being constructed and should be admirable for those pilots who have attained proficiency in the training type glider. At a later date we hope to publish full details of this machine.

THE BRITISH GLIDING ASSOCIATION has taken an office at 44a, Dover Street, W.1. The Hon. Sec. would like to apologise to all those who have not yet received replies to their letters and says that now he will be able to cope with the mass of correspondence which has been pouring in. In Germany, the Rhön-Rossitten Gesellschaft, and in the U.S.A., the National Glider Association, Inc., have drawn up regulations to ensure the adequate strength and safety of gliders, and sail-planes. They issue certificates of airworthiness, approve gliding grounds and license pilots and instructors for these engineless aircraft. In Great Britain, the British Gliding Association will do the same work. Full regulations will be announced at the Inaugural Meeting, on March 27. Lord Wakefield is presenting a cup to the Association which will be awarded for the most meritorious performance. The actual conditions will be announced later. The following affiliated clubs are in the process of formation: Cardiff, Dirt Track Riders, Evesham, Gloucester, Halton, Harrogate, Kent, London, Manchester, Newcastle.

By the time these notes appear in print, Dr. Georgii and Herr Stamer will have delivered their lectures before the Royal Aeronautical Society, and next week we shall publish a full report of these. These two gentlemen have recently inspected some suitable sites in this country, with Col. the Master of Sempill, and they expressed themselves delighted with the prospects in the Dunstable district. There is much work to be done in charting the air, and finding suitable routes for the soaring "sailplane" to follow. The work of making these air charts will be one of the activities of the Gliding Association.

THE DE HAVILLAND CO. report that they have received an order for a large number of their Gipsy engines from Saunder-Roe, Ltd., of Cowes, which will be fitted to Blackburn Bluebirds.



THE INTERNATIONAL TOURING COMPETITION, 1930

Summary of Regulations

THE organisation of this year's International Touring Competition for light 'planes is, as a result of a German victory in 1929, in the hands of the Aero-Club von Deutschland, and the rules and regulations for 1930 have just been issued.

As previously, the competition is confined to light 'planes, two classes of which are eligible:—Class I, machines with at least two seats, and of a tare weight of less than 400 kg. (880 lbs.); Class II, machines with at least two seats, and a tare weight of less than 280 kg. (616 lbs.). In view of the fact that some of the stages to be flown are fairly long, an increase on the tare weight of 15 per cent. will be permitted at the start.

This year's competition will start and finish at one of the Berlin aerodromes (details to be issued later), and is divided into two sections—a circuit of Europe, and a number of technical tests. The circuit of Europe is to be flown during the period July 20–31, and the technical tests will be made from August 1 to 7.

The Circuit of Europe

The circuit of Europe is designed as a test of speed, regularity, fuel economy and general practical qualities of the aircraft in the way of safety, comfort, etc.

The circuit of Europe which has been planned for the competition is shown, with compulsory stopping places and approximate distances, in the following table:—

Stage.	Distance Kiloms.	Miles.
Berlin-Brunswick	202	125
Brunswick-Frankfurt a. M. ..	273	170
Frankfurt a. M.-Rheims	349	217
Rheims-St. Inglevert	240	149
St. Inglevert-Bristol	310	192
Bristol-London	174	108
London-St. Inglevert	137	85
St. Inglevert-Paris (Orly) ..	241	150
Paris (Orly)-Poitiers	289	180
Poitiers-Pau	366	228
Pau-Saragossa	193	120
Saragossa-Madrid..	280	174
Madrid-Sevilla	387	240
Sevilla-Albacete	411	255
Albacete-Barcelona	420	261
Barcelona-Nimes	339	210
Nimes-Lyons	216	134
Lyons-Lausanne	158	98
Lausanne-Berne	80	50
Berne-Munich	338	210
Munich-Vienna	368	228
Vienna-Prague	260	161
Prague-Breslau	205	127
Breslau-Crakau	245	152
Crakau-Warsaw	252	156
Warsaw-Konigsberg	281	175
Konigsberg-Danzig	133	83
Danzig-Berlin	406	252
Total	7,553	4,690

Machines will be weighed at Berlin before the start, and again after they have finished the circuit of Europe. The tare weights must be the same after the completion of the flight, but a tolerance of plus or minus 5 per cent. will be permitted.

Competing machines must be on the Berlin aerodrome by 12 noon on July 18. The latest time by which machines may return to Berlin from the circuit of Europe will be at 4 p.m. on July 31. During the circuit of Europe the pilot of a machine may not be changed, but a change of passengers is permitted. The substitution of a passenger by ballast is not permitted, and at least two of the seats must be occupied during the entire circuit.

No change of the following parts of aircraft and engine is permitted:—Lifting surfaces, ailerons, tail surfaces (fixed and moving), fuselage, undercarriage (excepting the wheels), airscrew, cylinders, and crankcase. The only exception is the airscrew, which may be changed provided a spare airscrew identical with the original is carried on board throughout the circuit. Breaking of the engine seals will not disqualify, but a competitor will be mulcted 30 points.

The start will be made "in principle" at Berlin at 9 a.m. on July 20, the order to depart being given by the Comissaires Sportifs. At the compulsory stops machines will be officially timed in and out between the hours of 7 a.m. and 8 p.m. On the first day, however, competitors who start from Berlin more than 15 and less than 30 minutes after the first machine will be timed at controls up to 8.15 p.m., and those who start from Berlin more than 30 minutes after the first machine will be allowed up to 8.30 p.m. The official control at Berlin will be open for returning machines at 4 p.m. on July 27, and will be closed at 4 p.m. on July 31.

Regularity Test.—For judging regularity use will be made of the award of points, a competitor starting the circuit of Europe with 75 points, and points being deducted for various "offences." In principle a competitor has to spend the night in one of the compulsory stops. A competitor who spends one night outside a compulsory stop is mulcted 15 points. For a second night spent outside a compulsory stop he is mulcted 30 points (*i.e.*, 45 points for two nights). More than two nights spent outside a compulsory stop leads to disqualification. A competitor arriving at a compulsory stop after the official closing time will be treated as having spent the night outside. A competitor who fails to complete one stage in a day will be mulcted 10 points. If he defaults by two days he will be mulcted 20 points, *i.e.*, a total of 30 points.

The Speed Test.—In this the time spent in the compulsory stops will be deducted, and the speed will then be based on $\frac{\text{total length of stages.}}{\text{total time taken.}}$ The speed will be reckoned to the nearest complete kilometre, figures below 0·5 km. being referred to the next lower whole kilometre and figures of 0·5 km. upwards being referred to the next higher whole kilometre. Machines in Class I must average at least 80 km./hr. (50 m.p.h.), and those of Class II must average not less than 60 km./hr. (37 m.p.h.). For speed a maximum of 195 points will be awarded, a sliding scale being used as follows:—For machines in Class I, from 80 to 90 km./hr. (50 to 56 m.p.h.), no points awarded; for 91 to 135 km./hr. (56·5 to 84 m.p.h.), 3 points per km./hr.; for 136 to 155 km./hr. (84·5 to 96 m.p.h.), 2 points per km./hr.; for 156 to 175 km./hr. (97 to 109 m.p.h.), 1 point per km./hr.; for speeds higher than 109 m.p.h. no extra points will be awarded.

For machines in Class II the award of points is as follows: for 60 to 70 km./hr., no award; from 71 to 115 km./hr., 3 points per km./hr.; for 116 to 135 km./hr., 2 points per km./hr.; for 136 to 155 km./hr., 1 point per km./hr.; above 155 km./hr. no extra points.

Maximum points for speed in both classes, 195.

The Technical Tests

Competing machines will be examined at Berlin, and the various flying tests carried out there, during the period August 1 to 7. A maximum of 140 points may be awarded for the following practical qualities of competing aircraft: (*a*) comfort, 42; (*b*) undercarriage, 15; (*c*) engine starting, 12; (*d*) fire protection, 6; (*e*) dual control, 6; (*f*) instruments, 15; (*g*) safety appliances, 14; (*h*) ease of dismantling and erecting, 30. To give full details of all these awards of points would lead us too far, and intending competitors are asked to obtain the official rules and regulations from the Royal Aero Club.

Starting and Landing Tests.—A total of 60 points may be awarded for these two tests, which may be carried out during the same flight or in two successive flights.

A somewhat complicated basis has been chosen for the take-off tests. The competitor places his machine at any desired distance not exceeding 400 m. from an obstacle 8 m. (26 ft. 3 in.) high, and takes off and clears the obstacle. As run to take-off is taken the distance from the wheels (at point of opening engine) to the obstacle, increased by the product of the wind speed (in metres per second) at obstacle at moment of test and the time between the machine beginning to roll and the moment of passing over obstacle. This is, of course, to make allowance for any difference in wind during tests of various competitors.

The competitor whose run to take-off in this way is the shortest will be awarded 30 points, and other competitors will be awarded points based upon this, the difference in run to take-off between the best and the other competitors being

used as a basis. A competitor whose run to take-off exceeds that of the best take-off run by from 1 to 30 m. will be awarded one point less per $3\frac{1}{3}$ m. than the 30 points awarded to the best take-off. For a difference of 31 to 90 m. a competitor will be awarded one point less for each 5 m.; and for 91 to 180 m. a competitor will be awarded one point less for each 10 m. No points will be awarded machines taking more than 400 m. to get over the obstacle.

In the landing tests the machine will be held to be alighting over an obstacle 8 m. high into a field 40 m. wide. The landing test is, in fact, the take-off test reversed, the direct distance between the machine at rest and the obstacle, increased by the product of the wind and the time lapsed between crossing the obstacle and coming to rest. Wheel brakes are permitted if they are carried throughout the circuit of Europe. The machine with the shortest run, measured in this fashion, receives 30 points, and the other machines receive less points in proportion to their longer run, the points being calculated on the same basis as for the take-off.

Petrol Consumption Test.—For this test the petrol will be supplied by the organisers, and will be of the usual density of 0·720/0·730. Nothing may be added by competitors to this "official" fuel. The consumption test will include a flight over a closed circuit totalling 300 km. (186 miles). In this flight the weight of two occupants must equal, or be made up to 150 kg. (330 lb.) for 2-seaters and 225 kg. (495 lb.) for 3-seaters.

Machines of Class I with a consumption of not more than 16 kg. for every 100 km. (56·7 lb. per 100 miles) will be awarded a total of 10 points. In addition, for each 250 grammes (0·55 lb.) saved, 1 point will be awarded, up to 20 points. In Class II the figure is 11 kg. per 100 km. (39 lb. per 100 miles), with an award of 1 point for every 175 grammes (0·385 lb.) saved.

Failure of the first attempt, through engine trouble for instance, will not disqualify a competitor, but by making a second attempt he will lose half the points gained in this test.

Entries and Prizes

The entrance fee is 1,000 francs up to March 15, and 2,000 francs up to May 15. All entries must be made through the national aero club, in the case of Great Britain through the Royal Aero Club.

The prizes offered are: First, 100,000 francs. Second, 50,000 francs. Third, 25,000 francs. Fourth, 15,000 francs. And in addition there are 16 prizes of 10,000 francs each, a total of 350,000 francs.

Further particulars will be issued after the closing of the entries list, probably early in June.

The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

ANNUAL GENERAL MEETING

The Annual General Meeting of the Members of The Royal Aero Club will be held at 3, Clifford Street, London, W.1, on Wednesday, March 26, 1930, at 8.30 p.m.

Notices of Motion for the Annual General Meeting, signed by at least five members, must be received by the Secretary not less than 21 days before the meeting.

Election of Committee.—In accordance with the rules, the Committee shall consist of 18 members. Members are elected to serve for two years, half the Committee retiring annually.

Retiring members are eligible for re-election.

The retiring members of the Committee are:—Air Vice-Marshal Sir W. Sefton Brancker, K.C.B., A.F.C.; Capt. H. S. Broad, Maj. C. J. W. Darwin, A. H. Downes-Shaw, Maj. A. R. Goodfellow, Col. F. Lindsay Lloyd, C.M.G., C.B.E.; Lieut.-Col. J. T. C. Moore-Brabazon, M.C.; Lieut.-Col. M. O'Gorman, C.B.; Maj. H. A. Petre, D.S.O., M.C.

Any two members of the Club may nominate a member to serve on the Committee provided the consent of the member has been previously obtained. The name of the member thus nominated, with the name of his proposer and seconder, must be received not less than 14 days before the Annual General Meeting.

House Dinner.—A House Dinner will be held at the Royal Aero Club on Wednesday, March 26, 1930, at 7.30 p.m. The price of the dinner is 6*s.* Members wishing to attend are requested to notify the Secretary.

The dinner will be followed by the Annual General Meeting of the Club, at which members will have the opportunity of discussing the affairs of the Club.

KING'S CUP AIR RACE

The race for the cup, presented by His Majesty The King, will take place on Saturday, July 5. The race this year will be confined to one day only and the course will be, approximately, 750 miles. The start and finish will be in London, and the most northerly control will be at Newcastle-on-Tyne. The regulations will be issued shortly.

INTERNATIONAL TOURING COMPETITION FOR LIGHT AEROPLANES

This competition, organised by the Aero Club of Germany, will take place on July 20—August 7, 1930, over a course of approximately 7,500 kms. There will be two controls in England, viz., Bristol and London. The organisation, as far as England is concerned, is in the hands of the Royal Aero Club.

The regulations can be obtained on application to the Royal Aero Club, 3, Clifford Street, London, W.1. (A summary is published in Flight this week.)

Offices: THE ROYAL AERO CLUB
3, CLIFFORD STREET, LONDON, W.1.
H. E. PERRIN, Secretary

THE F.B.I. AND EMPIRE AIR TRANSPORT

The Federation of British Industries has prepared a report for submission to the Preparatory Committee to the Imperial Conference. The proposals are very far-reaching, and, though naturally they have not all an air interest, it will be worth while to quote the main headings. These are:—

The calling, at as early a date as possible, of an Imperial Trade Conference, composed of persons nominated by each Government of the Empire, but acting in their personal capacity.

The establishment of a permanent Imperial Economic Secretariat to watch and report between conferences.

An extension of the activities of the Empire Marketing Board.

Financial encouragement by the British Government of Empire air transport.

The creation of an Empire College in London; overseas students to be enabled to live in London for at least a year.

To us who have lived through the lean years in which flying has been generally regarded as in turn a scientific toy, a merely military weapon, a hobby for cranks, and an all-round failure, it comes as somewhat of a delightful shock to see such an important body as the F.B.I. calling upon the British Government to spend money on Empire air transport, and giving the subject a place in the forefront of its programme.

This fact should greatly strengthen the hands of the Air Ministry in dealing with the Exchequer. It justifies the expenditure on airship research, and it should also justify greatly increased expenditure on research on and development of flying boats.

AIR TRANSPORT

HIGH SPEED ON N.A.T. AIR LINES

PILOTS of National Air Transport started the new year with an orgy of speed that shattered all divisional records of the N.A.T. lines between New York, Cleveland, Chicago, Kansas City, Oklahoma and Texas, with the exception of one. On the night of January 5 the mail was flown from Dallas to Chicago, a distance of 995 miles, in 5 hrs. 20 mins., an average speed of 187 miles an hour. The Dallas-Kansas City division, through Ft. Worth, Oklahoma City and Ponca City, a distance of 541 miles, was flown by Pilot James D. Cleveland in 3 hrs. 10 mins. flying time, beating the previous record of 4 hrs. made by Pilot Richard L. Dobie a few days before. At Kansas City Pilot Robert W. Radoll relieved Cleveland at the controls and flew the 454 miles to Chicago in 2 hrs. 10 mins. flying time, a new record for the division, making the last 150 miles from Moline to Chicago in 50 mins., or 180 miles an hour. The highest speed registered between two points on this flight was the 627 miles from Wichita to Chicago, which was flown at an average speed of 208·8 miles an hour. The same night Pilots Dan Linsey and S. J. Samson, took the second section of the night transcontinental mail through from Chicago to Hadley Field, the New York terminus, in 4 hrs. 45 mins. flying time, an average speed of 150 miles an hour. The best previous time for the whole division was 4 hrs. 50 mins. A few days before Pilot Henry J. Brown had carried the mail over the Cleveland-New York section in 2 hrs. 10 mins., an average speed of 3·03 miles per minute. On the day run from Dallas to Chicago, by way of Tulsa, Kansas City, St. Joseph and Moline, Pilots Lewis M. Gravis and Paul Reeder set a new record of 5 hrs. 35 mins. The only N.A.T. record left intact after this onslaught of speed is that of Pilot Robert P. Hopkins who, one year ago, flew the 318-mile Chicago-Cleveland through Toledo section in 100 minutes.

The Indian Air Mail

IMPERIAL AIRWAYS, LTD., have issued a time-table for the London-Karachi-Delhi air service as at present operating. We hope to publish the detailed table next week. For the moment we may state that, as a temporary arrangement, the only European section to be flown is Croydon-Cologne. Thence the Orient Express is used as far as Athens. Alternatively, passengers may travel direct from London to Athens by the Simplon Orient Express, or by steamer to Egypt to connect with the airway at Cairo. The Simplon-Orient Express leaves Victoria on Saturdays at 11.20 and the Gare de Lyon at 20.50 the same day, reaching Athens on the Tuesday at 18.59. The Calcutta flying boat leaves the Athens airport (Phaleron Bay) at 4.30 G.M.T. on the Wednesday and reaches Alexandria Harbour at 15.30. The night is spent at Cairo. Thursday night is spent at Baghdad, Friday night at Bushire, and Saturday night at Jask. Karachi is reached on Sunday at 10 a.m. (eight days after leaving London), and Delhi on the Monday at 10 a.m. The passenger fare from Athens to Karachi is £89. It is hoped that before long a through service by air from London may be arranged and that the service may be expedited.

Air Route to Australia

REFERRING to the Singapore—Port Darwin air route, Mr. Scullin, the Australian Prime Minister, said that, though the British Government seemed to have assumed that the Commonwealth was ready to subsidise the Singapore-Australia section of the proposed air service to Australia, such an undertaking had not been given. It was not yet decided whether it would be preferable to have the service under the control of Imperial Airways or to form an Australian subsidiary company.

A Second Airport for London

HESTON Air Park, on the Great West Road, will become available as an alternative airport for London on March 1. From that date a customs office will be open every day, and when air liners bound for Croydon are prevented from reaching it by fog they will make for Heston if the weather is clearer there.

Turko-German Air Mail Service

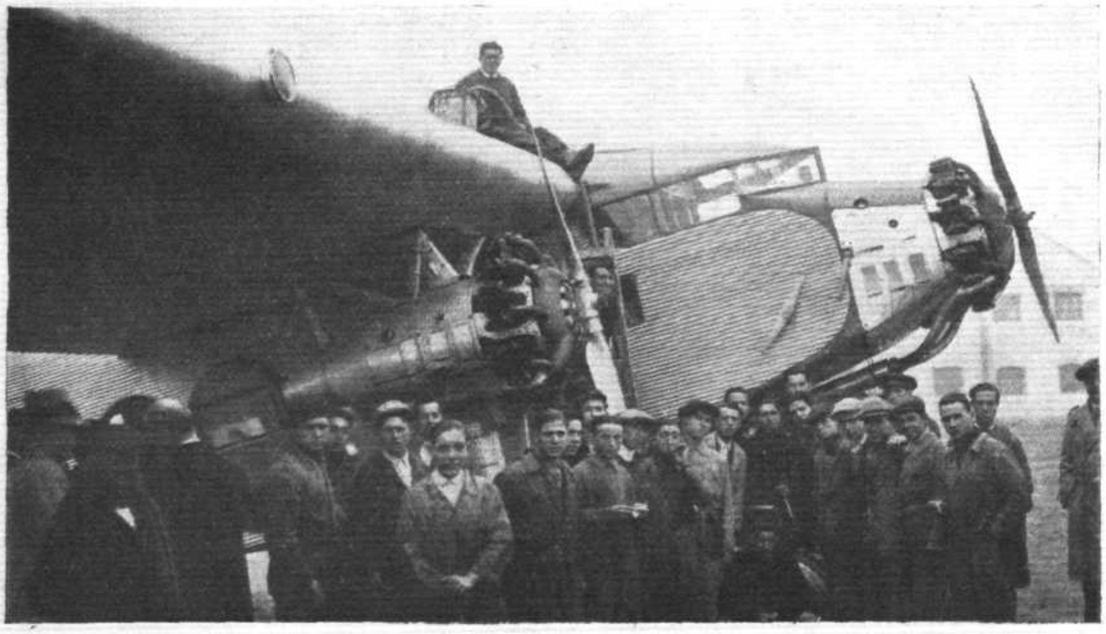
IT is reported that Turkey has signed a 20 years' contract with a German company for the establishment of an internal (in Turkey) air mail service. Junkers aircraft will be employed.

Reductions in U.S. Air Mail Fees

IN connection with a campaign to popularise air mail services, the United States Post Office authorities are making considerable reductions in their charges on the service to Latin-America. The greatest reduction applies to the service to Argentina, Chile, Paraguay, and Uruguay. The rate for Chile will be reduced to 50 cents for 15 grammes, and for the other three countries it will be reduced to 55 cents. The new tariff for Peru is 40 cents. It has also been announced that a new line to Brazil will be inaugurated shortly.

Washington-Buenos Aires "Lighter-than-air Mail"

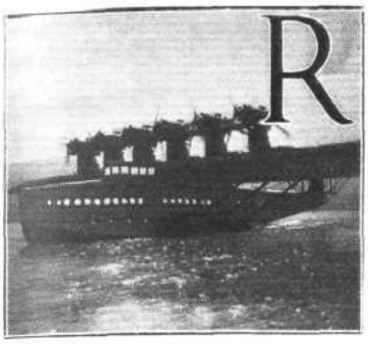
A SCHEME, it is reported, has been submitted to the U.S. Postmaster-General by Mr. Walter Link, president of the American Airship Association, for the establishment of a passenger and mail airship service between Washington and Buenos Aires. The A.A.A., which intends to build airships for the purpose, proposes to run a weekly service in each direction, via Bermuda, Porto Rico, Paramaribo, Belem, Recife, Rio de Janeiro, Sao Paulo, and Montevideo.



A Ford all-metal monoplane arrives at Madrid for the Madrid–Paris line. It was embargoed at Seville by the Junkers Co. regarding patent rights, but later released under bond.

THE DORNIER Do. X

First Authentic Data and Particulars



RARELY in the history of flying has a machine so captured the imagination as has the large Dornier flying ship, the "Do. X." The size is beyond anything previously accomplished; the lines of the machine are unusual; and the power plant arrangement is novel. Ground enough surely, for being intrigued, and for wishing "to know all about it." FLIGHT has published illustrations of the Do. X on more than one occasion, and has commented editorially on its main features. Hitherto, however, the necessary authentic data have not been forthcoming, in the absence of which it has been a little difficult to form a true picture of what the Do. X is, and what it really means. We have now received from Dornier Metallbauten of Friedrichshafen on Lake Constance, a small booklet in which is set forth an account of the underlying ideas of the Dornier engineers in producing this machine, details given of the construction, and accurate data supplied concerning such items as dimensions and areas, weight, performance, etc. Thus we feel that we are better equipped to deal with what is the most interesting design of modern times, and that FLIGHT readers will not mind—in fact, will wish us to—if we return once more to the subject of the Do. X.

Dr. Claudius Dornier, like Dr. Rohrbach, began his aeronautical career with the Zeppelin company, and during the early days, when Rohrbach and Baumann were designing the large four-engined Zeppelin Staaken monoplane which, as a result of gross stupidity, was later destroyed because of certain clauses in the Treaty of Versailles, Dr. Dornier began to occupy himself with the subject of seaplanes and flying-boats. He produced, first as chief designer at the Zeppelin Lindau works and later as head of his own company, a series of flying-boats, the earlier types of which those sufficiently interested may find described in FLIGHT of December 16 and 23, 1920.

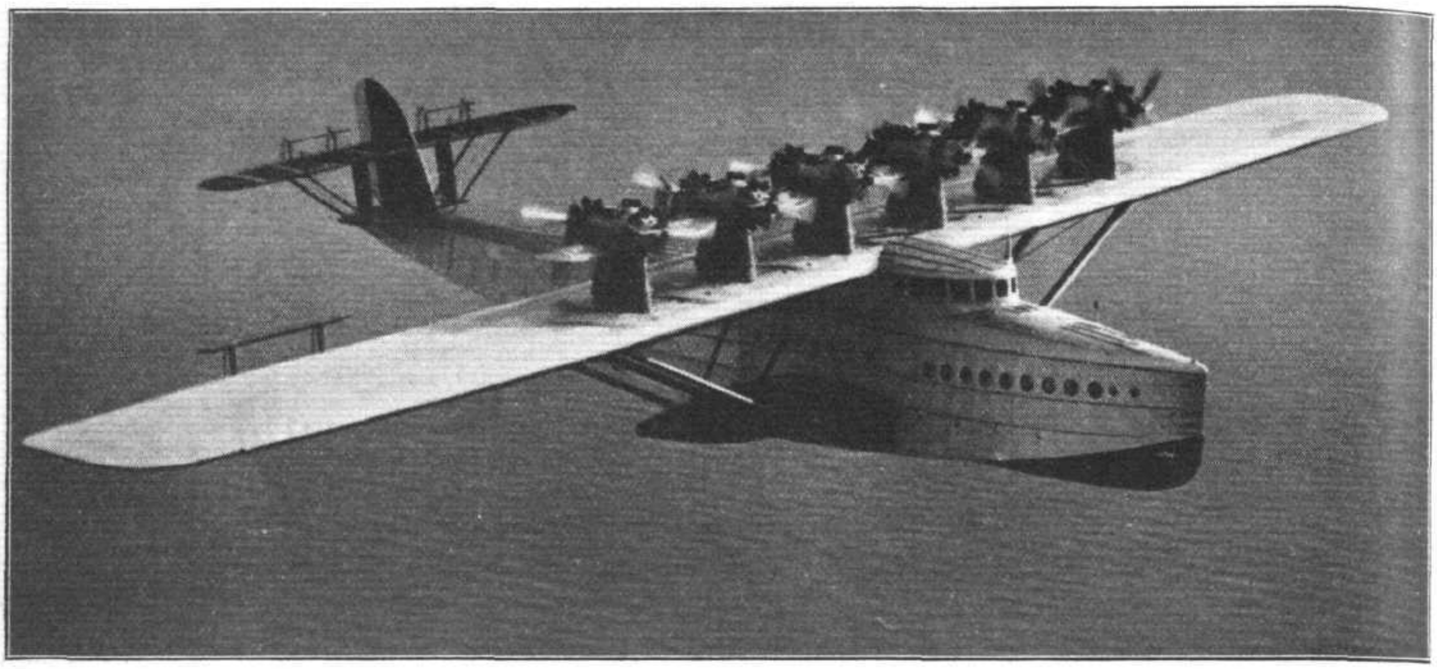
Quite early in his career Dr. Dornier adopted short wing stumps springing from the sides of the boat hull for obtaining lateral stability on the water. In one early example, the Do. Rs. II, these stumps were braced by struts from *below*, and they must have caused the machine to be very "dirty" on the water. In those early days, too, the tail surfaces were carried either on boom outriggers or on a fuselage placed high above the hull. In the Gs. I, produced in 1919, Herr Dornier for the first time carried his tail surfaces on the main hull, which was extended right aft instead of the rather short sort of "Bat boat" hull which he had previously favoured. In the Do. Gs. I the wing stumps had become pure cantilever members; and, furthermore, the main wing lift struts were anchored to the tips of the stumps. The power plant consisted of two water-cooled engines in tandem, placed above the monoplane wing. From this machine developed as a logical outcome the Dornier Gs. II, the Wal, and the Superwal, gradually increasing in size and power, but retaining all the fundamental features of the Gs. I. From that machine, therefore, may be said to date Dr. Dornier's real programme of flying-boat development, and the Gs. I is the ancestor of the long series of boats which has now culminated in the production of the Do. X. No other flying-boat designer in the world has had the opportunities of Dornier, who, already during the war, was not expected to turn out military aircraft which must be immediately successful, but who was given more or less a free hand to prepare for the future by evolving commercial flying-boats.

We have dealt with this phase of Dr. Dornier's work at some length, because only if one knows something of his earlier history can one obtain the correct perspective for judging his latest work. We believe we are correct in stating that altogether Dr. Dornier has produced no less than 28 types (not all flying-boats).

Before the actual work of designing the Do. X could be started, a large number of theoretical and scientific investigations had to be made because, although it was not desired to introduce any unknown features where it could be avoided, the very size of the projected machine called for much work in determining the most economical type of structural members, and so forth. This preliminary work was begun in 1924. In December, 1927, actual construction was commenced in the new works at Altenrhein. The first test flight was made on July 12, 1929.

Aerodynamic Design

The Do. X is a semi-cantilever monoplane flying-boat, with the engines placed above the main wing, in six tandem



pairs, and a small auxiliary wing joining them. A good deal of speculation concerning this wing has occupied those interested in the Do. X, and it has even been claimed that by fitting it Herr Dornier has obtained a "sort of slot effect" and greater lift. We could never, personally, see any reason for this supposition, and the booklet sent us by the Dornier company makes it quite clear that the auxiliary wing is a structural member first and foremost, serving to steady the engine mountings laterally.

The boat hull is of fairly normal Dornier design as regards its external shape. Minor differences are formed on the one hand by the control cabin, which projects above the main deck and may be expected slightly to increase the drag, and on the other hand by a rounding of the stumps into the hull, which may slightly reduce the drag. The control surfaces are fairly normal and are all balanced by secondary surfaces.

As regards the aerodynamic efficiency of the Do. X, the aspect ratio (if one may be so old-fashioned as to use this expression) is low (about 5) and the span loading is very high. This is, of course, merely another way of saying that the induced drag is high. To that the designers of the Do. X would probably reply that this is not of serious consequence, as the machine has a small speed range and a high take-off speed.

If one now turns to the—in this particular instance, perhaps, more important—question of minimum drag coefficient, it is of considerable interest to find that this is rather surprisingly low for a multi-engined machine. For example, at the normal gross weight of 46 metric tons (101,200 lbs.) the wing loading is 19·3 lbs./sq. ft. Assuming the engines to develop a normal output of 500 h.p. each, the total power is 6,000 b.h.p. and the power loading is 16·88 lbs./h.p. The "wing power" in that case is 12·33 h.p./sq. m. (1·15 h.p./sq. ft.). For a top speed of 130 m.p.h. this corresponds to a "high-speed figure" $\frac{\eta}{2\,k_D}$ of 13, which would appear to be as high as that attained by many smaller machines, even single-engined types. Doubtless the tandem engine arrangement has resulted in the drag being quite considerably lower than it would have been had the engines been spread out.

THE DORNIER DO. X

12 Siemens-Jupiter 525 h.p. Engines

Weights	
Tare Weight (stripped) ..	28·2 *tons* (62,100 *lbs.*)
Tare Weight (equipped) ..	30·0 *tons* (66,000 *lbs.*).
Gross Weight (normal) ..	46·0 *tons* (101,200 *lbs.*).
Gross Weight (maximum) ..	52·0 *tons* (114,400 *lbs.*).
Dimensions	
Length o.a.	40·05 *m.* (131 *ft.* 4 *in.*).
Wing Span	48·0 *m.* (157 *ft.* 5 *in.*).
Height	10·25 *m.* (33 *ft.* 7 *in.*).
Wing Chord	9·5 *m.* (31 *ft.* 2 *in.*).
Total Wing Area	486·2 *sq. m.* (5,225 *sq. ft.*).
Max Beam of Hull ..	4·8 *m.* (15 *ft.* 9 *in.*).
Beam over Stumps ..	10·0 *m.* (32 *ft.* 10 *in.*).
Total Length of Cabins ..	23·5 *m.* (77 *ft.*).
Mean Width of Cabins ..	3·2 *m.* (10 *ft.* 6 *in.*).
Fuel Capacity	
In Hull, 4 *tanks at* 3,000 *l.*	12,000 *l.* (2,640 *gals.*).
In hull and leading edge 4 ..	4,000 *l.* (880 *gals.*).
Normal Capacity	16,000 *l.* (3,520 *gals.*).
Further tanks can be added of	8,600 *l.* (1,890 *gals.*).
Max. Petrol Capacity ..	24,600 *l.* (5,412 *gals.*).
Oil Capacity	
6 *tanks at* 100 *l. in nacelles*	600 *l.* (132 *gals.*).
1 *tank in hull*	1,300 *l.* (286 *gals.*).
Total Oil Capacity ..	1,900 *l.* (418 *gals.*).
Performance	
Max. Speed (according to engines fitted) ..	210–230 *km.* (130–143 *m.p.h.*).
Cruising Speed	170 *km./h.* (105 *m.p.h.*).
Duration (normal capacity)	12 *hrs. at cruising speed.*

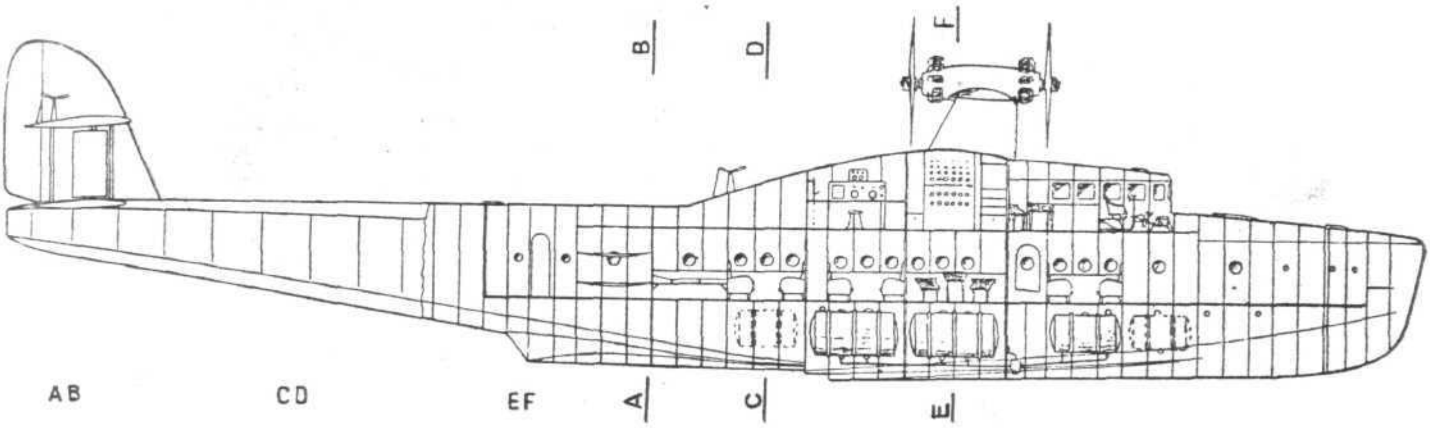
Constructional Features

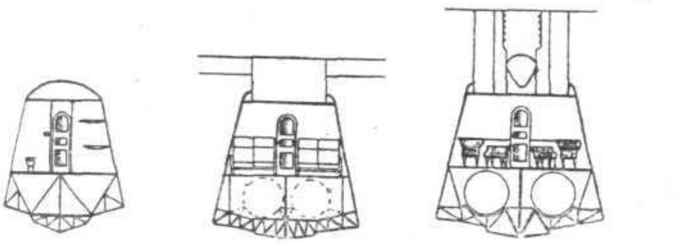
The boat hull of the Do. X is, in its outward shape, very similar to that of previous Dornier machines. The main step is placed rather farther aft than in British flying-boat hulls, and is formed with fore-and-aft shallow steps which gradually merge into the forward vee of the bottom. The rear step does not, as in British practice, extend laterally out to the chines but is of narrower beam than the main bottom, and is fairly deep. The Germans term this form of step a "displacement step" (*Verdrängungssporn*), presumably because it acts by displacement rather than by dynamic pressure. From the main step to the stern post the chine members are straight and swept up at a fairly pronounced angle so as to get the tail well clear of the water. Forward of the step the main bottom becomes, as already indicated, of pronounced V-form, to terminate finally in a straight raked stem.

The total length of the boat hull is 40·05 m. (131 ft. 6 in.). The beam, over the stumps, is 10 m. (32 ft. 10 in.), and the maximum beam of the hull itself is 3·5 m. (11 ft. 6 in.). The greatest depth of hull is 6·4 m. (21 ft.), and the draught empty is 0·8 m. (2 ft. 8 in.). At a gross weight of 50 metric tons the draught is 1·05 m. (3 ft. 5 in.), and the metacentric height 4·58 m. (15 ft.). Inclusive of the stumps, the hull has a volume of 400 cu. m. (141,200 cu. ft.), and in this connection it is interesting to record that the hull weight has been reduced in the Do. X to 21 kg./cu. m. (1·3 lb./cu. ft.), whereas in the "Wal" it was 26·2 kg./cu. m. (1·625 lb./cu. ft.) and in the little "Libelle" it was as high as 29·9 kg./cu. m. (1·85 lb./cu. ft.). The maximum cross-sectional area of the hull, exclusive of the stumps, is 17·2 sq. m. (185 sq. ft.). There are in the hull 58 main frames, spaced 0·7 m. (2 ft. 4 in.) apart. An innovation in construction as far as Dr. Dornier is concerned is the introduction of a deep keel girder which runs from the bows to the rear step

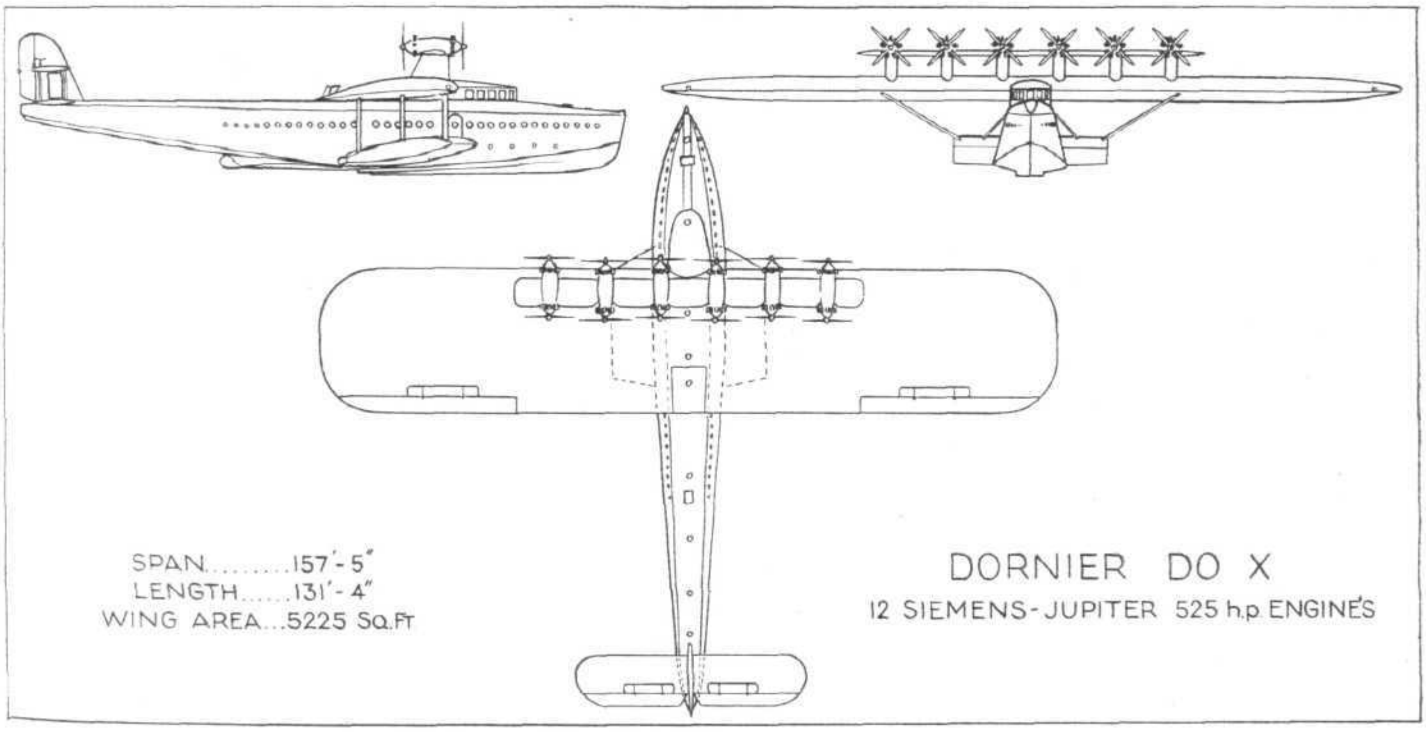
and has a length of 23·3 m. (76 ft. 5 in.) and a greatest depth of 2·12 m. (6 ft. 11 in.). This fore-and-aft girder stiffens the hull very considerably. Parallel with the keel girder, and spaced from it 0·9 m. and 1·58 m. (2 ft. 11 in. and 5 ft. 2 in.), are two keelsons on each side. These, with the transverse frames and keel girder, form a very strong structure and reduce the panels (themselves of heavy gauge) of the bottom to squares of about 0·63 sq. m.^{2} (6·8 sq. ft.).

chief engineer's control station, wireless room and so forth. The forward portion of this upper deck has windows along the sides and rounded front, and is in fact, a sort of enclosed "bridge" for the pilots and navigators. The other service compartments, engineer's control station, wireless room, auxiliary engine room, etc., are, however, inside the centre of the wing, and have consequently no windows on the sides. They extend aft as far as the trailing edge of the wing.



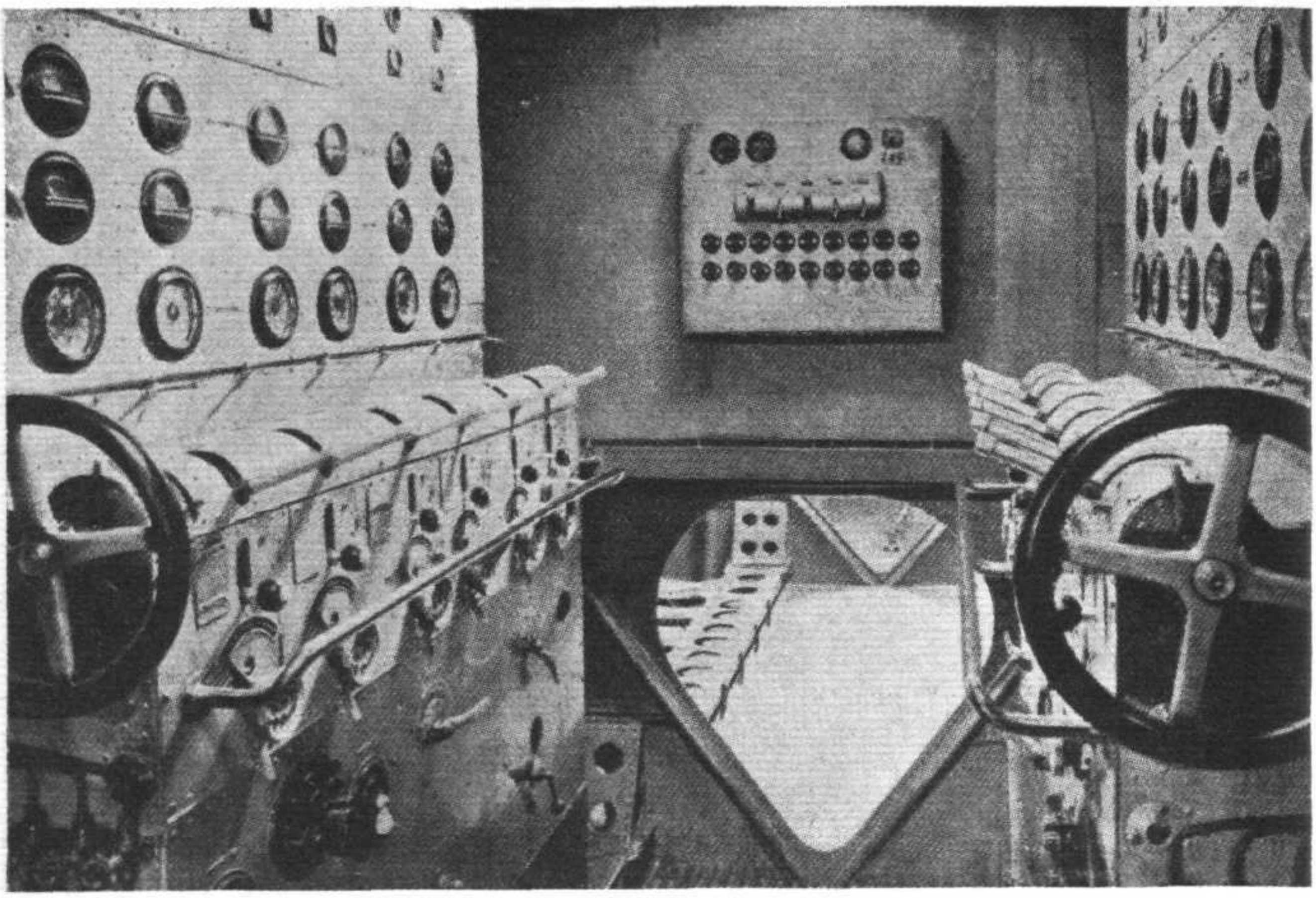


Above, sectional side elevations and transverse sections of the Do. X. Note the longitudinal steps and tumble-home sides. The rear step is narrow, and carries a water rudder (not shown). Below, three-view general arrangement drawings.

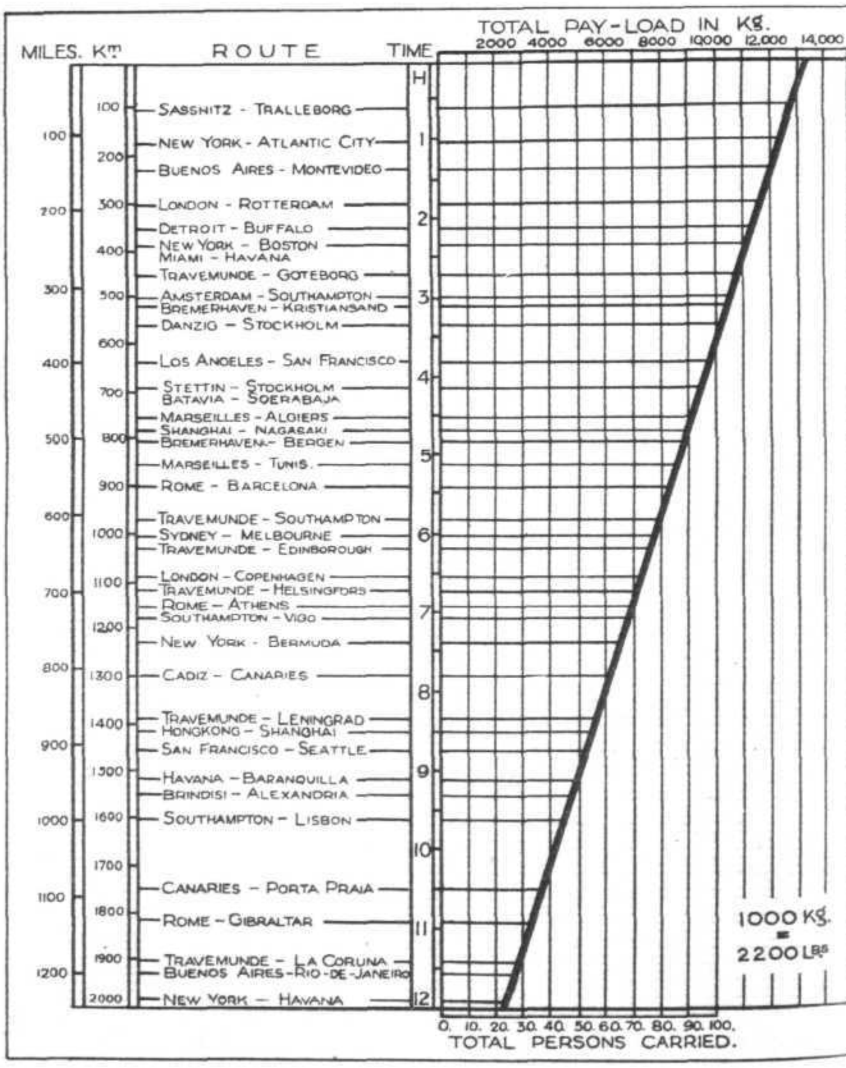


The large dimensions of the Do. X have allowed of an internal arrangement unlike those of previous flying-boats, and more resembling the lay-out on board a surface vessel. The main deck is located some 4 ft. above the load water line, and forms the floor of the main accommodation for passengers. Below this deck, the hull is divided by eight watertight bulkheads into nine compartments. The side stumps themselves (of a total volume of 43·5 cu. m. (1,550 cu. ft.)) are divided each into four watertight compartments, so that altogether the hull would have to sustain very considerable damage before the machine is likely to sink, providing the bulkheads do not give way. Below the main deck, in the watertight compartments, the main petrol tanks are mounted, their number depending upon the length of route over which the machine is to be operated. The passengers' quarters are totally above the water line, and the construction is such that the subdivision of them is reduced to a minimum, the watertight compartments finishing at the main deck. Above the passengers' quarters are the crew's quarters, and the various service compartments, such as pilots' cabin,

The wing, which has a span of 157 ft. 6 in., and a chord of 31 ft. 2 in., differs in construction from previous Dornier types in that three main spars are employed, of which the middle is situated at approximately the greatest depth of the wing section. The front and rear spars are placed 9 ft. 2 in. from the middle spar. The spars are built up of angle sections and laminated flange strips, the number of laminations in the flanges being proportional to the stresses from point to point. Box ribs are placed at distances of from 2·8 to 3·6 m. (9 ft. 2 in. to 11 ft. 10 in.), and the metal panels of the wing covering are riveted to them and to the spar flanges. This metal covering extends outward to the outer engine nacelles only, the wings from there to the tips being covered with fabric. The maximum depth of wing section is 1·28 m. (4 ft. $2\frac{1}{2}$ in.), and the result is that almost every part of the internal wing structure can be reached for inspection by a man crawling about inside. Attachment of the wing to the hull is by a number of large bolts, situated inside the covering and offering no extra drag.



The Engine Control Room is placed on the upper deck and communicates with the wing and, through it, the engine nacelles.

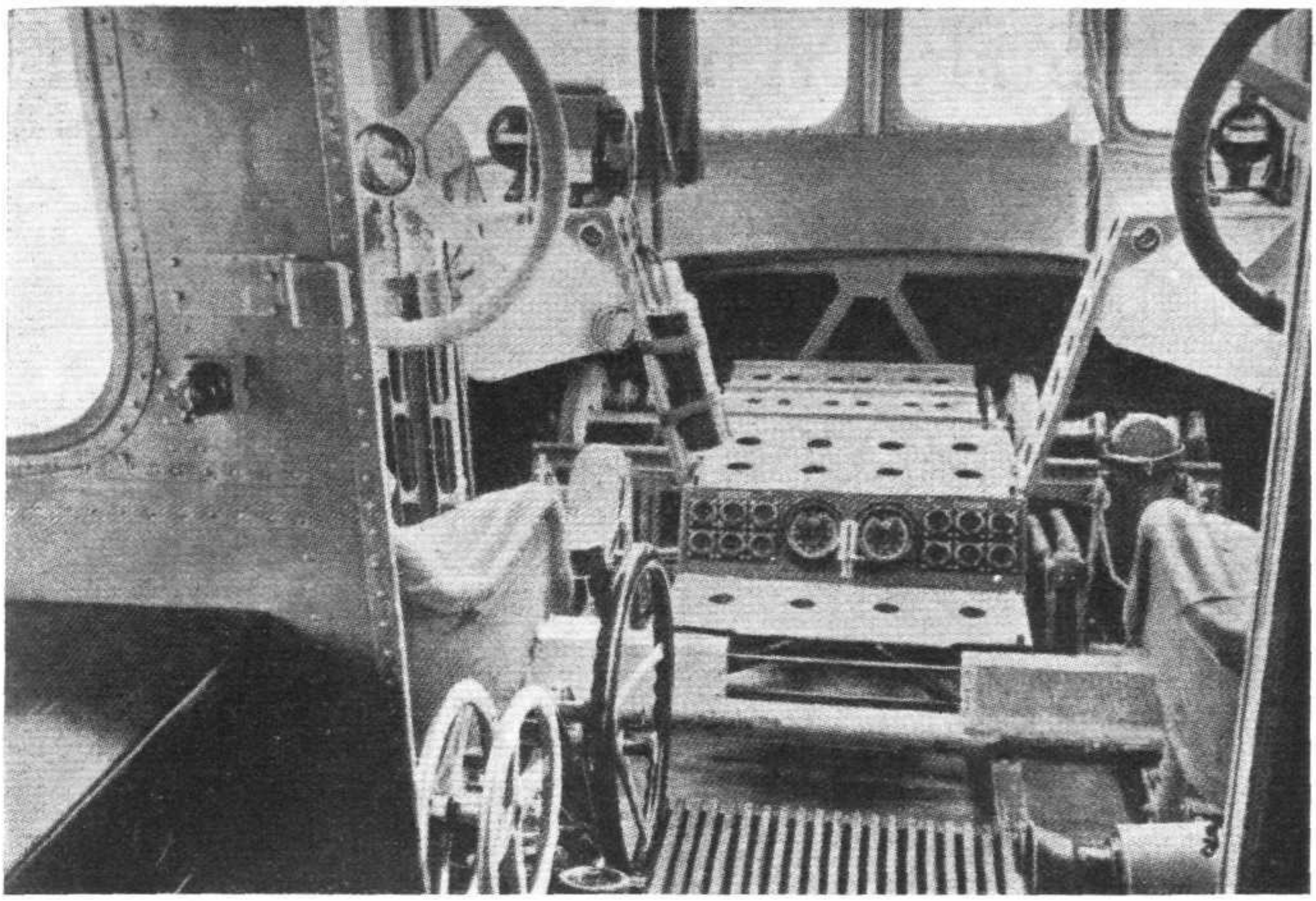


Range and pay load of the Do.X. The chart is self-explanatory, but it might be pointed out that comfortable accommodation can be provided for 100 passengers only, so that when the range is short, and the pay load exceeds 22,000 lb., the balance must be made up with mails and/or freight.

The small auxiliary wing serves to brace and steady the engine mountings, and it is worth noting that it is so designed as to take no part of the wing stresses. In fact, in order to avoid the possibility of throwing unexpected stresses on the main wing, the auxiliary wing is arranged with flexible joints between the outer engine nacelle and the next, so that should the main wing deflect under load, the auxiliary wing can "give" to any extra loads.

The control surfaces are of fairly normal design, and are all provided with separate surfaces acting as balances. The tail is of "sesquiplane" type in that there is a small tail plane resting direct on the stern portion of the hull, and a main tail plane higher up, braced to the lower and to the hull by struts. The rudder balances take the form of vertical surfaces placed between the top and bottom tail planes, as distinct from the horn balance or servo rudder used on large British flying-boats. The operation of the control surfaces is by steel rods, or tubes, suspended on pendulum cranks. Ball bearings are used throughout. Trimming of elevators and rudder is achieved by a setting of the separate balance surfaces, the angle of which in relation to the main surface which they balance being adjustable from the cockpit. This setting is reported to be very easy, *i.e.*, to require but very small forces, and the machine is stated to be as easy on the controls as are smaller aircraft.

The power plant consists of 12 Siemens-Jupiter engines, arranged in six tandem pairs. The large number of engines required forced, it is stated, this arrangement on the designers, and it is an arrangement the advantages and disadvantages of which are familiar to the Dornier designers from more than 10 years' experience. The Dornier engineers argue that the use of tandem engines almost reduces the number



The Do. X: View of the pilots' control cabin.

of separate units to one-half, in that each tandem unit of two 9-cylinder engines is very little more complicated than one 18-cylinder engine, and is much more reliable in service. The drag of a tandem installation is, it is claimed, no greater than that of one larger engine, and the propeller diameter, for same efficiency, is smaller. The Siemens-Jupiter engines of the Do. X are of the geared type, with 2 : 1 reduction gears. Great importance has been attached to accessibility of the engines, and by mounting the nacelles on streamline supports, all the engine nacelles can be reached from the interior of the wing. Inspection doors in the covering of the streamline supports give access to the interior of the nacelles when the machine is at rest.

As already mentioned, the quantity of petrol carried will depend upon the route operated. Normally, there are four main tanks of 3,000 litres (660 gallons) capacity each, resting on the floor of the hull, and a further two tanks of 1,700 litres (374 gallons) each, also resting on the floor, but slightly farther forward (see sectional side elevation). There are, furthermore, two small tanks of 300 litres (66 gallons) each housed in the leading edge of the wings, a total petrol capacity (normal) of 16,000 litres (3,520 gallons). The main tanks and leading edge tanks are connected to a collector (*sammeltopf*), and the fuel is pumped from the main tanks to the leading edge tanks. In order to avoid any possible breakdown in the petrol system, no less than three separate pump systems are provided: a windmill-driven pump, an electric pump, and a hand pump. From the leading edge tanks, the petrol is pumped by A.M. pumps to the carburettors, surplus petrol draining back into the collector. Oil tanks of 100 litres (22 gallons) capacity are housed in the engine nacelles, and there is a main oil tank of 1,000 litres (220 gallons) in the "bilge."

The engine controls of a multi-engined flying-boat like the Do. X presented something of a problem. Obviously, the pilot cannot himself attend to all the engines, their controls, etc. On the other hand, it is essential that the pilot should have full control of all the available power. With the arrangement selected, there is a main engine control room, reigned over by the chief engineer, and in this are concentrated the individual engine controls, engine instruments, etc. To avoid confusion, all the controls and instruments appertaining to the port engines are collected on the port side of the engine control room, and all those of the starboard engines on the starboard side. From this engine control room, two sets of engine controls are taken to the cockpit, or rather pilots' control room. Thus the pilot has but two engine controls, one of which operates the 6 port engines, and the other the 6 starboard. He also has two revolution indicators, of which one shows the mean revolutions of the six port engines, the other the mean revolutions of the six starboard engines. If one of the engines is disconnected from the pilot's engine controls, a red lamp lights up, on port or starboard side, to let the pilot know that he has not available the full power of all six engines on that side. Starting of the engines is by means of compressed air worked by an auxiliary engine in the main engine control room. The average time for starting all 12 engines is 4-5 mins. They *have* been started in 3 mins. It is reported that the engine installation is remarkably free from vibration.

The arrangement of the passengers' accommodation will depend upon the length of route and number of passengers carried. Normally, comfortable accommodation cannot be provided for more than 100 passengers, and it is pointed out that when the machine is used for routes so short that the pay load exceeds 10,000 kgs. (a passenger is taken to weigh, with luggage, 100 kgs., *i.e.*, 220 lbs.), the difference between the weight of the 100 passengers and the lift available for pay load will have to be made up of mails and/or freight. The various cabins, etc., available for passengers, measure, altogether, some 24 m. (78 ft. 9 in.) in length, and have an average width of about 3 m. (10 ft.).

A chart has been prepared which indicates the distances that can be traversed by the Do. X without refuelling, and the number of passengers, or the weight of mails and goods which can be transported over these distances. A few representative distances have been drawn in to give a better picture of what the various distances mean in practice. The chart has been based upon a take-off gross weight of 45 tons (100,000 lbs.), and in estimating the pay load available for the various distances, ideal weather conditions have been assumed, *i.e.*, still air. By carrying the usual 30 per cent. reserve of fuel, the take-off weight would be increased. Thus, it is stated that with a 30 per cent. petrol reserve for a distance of 1,800 kms. (1,120 miles), the take-off gross weight would be increased to 49·5 tons (109,000 lbs.).

AIRISMS FROM THE FOUR WINDS

The Flight to Australia

FLYING Officers H. L. Piper and C. Kay, R.A.F., both New Zealanders, who left Croydon on February 9 in a Desoutter cabin monoplane ("Cirrus Hermes") in an attempt to beat Bert Hinkler's record flight to Australia, arrived at Malta on February 12 and Baghdad on February 17.

Proposed Spanish Atlantic Flight

Two Spanish airmen Lieut. Haya and Commandant Morato are making final preparations for a non-stop flight from Seville to Havana. They will use a Breguet machine, similar to that used by Capts. Inglesian and Jiminez, who flew from Seville to Brazil last year.

Aerial Big-Game Hunting Expedition

BARON ROTHSCHILD has concluded his big game hunting expedition with gun and camera in Africa, in which he employed a Fokker monoplane, "*Switzerland III*," piloted by Walter Mittelholzer, who flew the machine out from Geneva. The party returned last week to Nairobi from the Serengetti plains in Tanganyika, where a successful six weeks' hunting was accomplished. The machine was used for transport purposes only, and wireless communication was maintained with Nairobi throughout the hunt. *Switzerland III* was due to start on the flight back to Geneva on February 17.

Stopping the Spin without Slots

THE general press at home, and in Germany, has been much impressed by a recent demonstration of "non-spinning qualities on the part of a Focke-Wulf commercial monoplane, the "Habicht" (Hawk). This machine, or one like it, was exhibited on the Focke-Wulf stand at the Berlin Aero Show in 1928, and is a "feeder line" type of machine with (in the exhibition machine) a Wright "Whirlwind" engine. At the recent demonstration over the Tempelhof aerodrome, Berlin, the machine was flown stalled on several occasions, and showed no signs of dropping into a spin. No "gadgets" of any sort are fitted, the stability being obtained solely by the shape of the wing and, one suspects, by a judicious forward placing of the c.g. The plan form of the Focke-Wulf machines has, in all types, been based largely on the Zanonia plant's winged seeds, much as were the early Taube monoplanes. In the Focke-Wulf monoplanes, however, the projecting, upward-turned flaps are much less pronounced, but apparently much of the lateral stability is still maintained. As the Focke-Wulf monoplanes have also been known for their good aerodynamic efficiency, it may be assumed that the stability is obtained without sacrificing other good qualities.

Oxford University Balloon Union

MR. HUGH SPEAIGHT and Mr. Giles Playfair, of Merton College, Oxford, are anxious to form a new club, to be called the Oxford University Balloon Union. If they can get sufficient support for their scheme they hope to organise branches, not only in Oxford, but all over the country. Ballooning they maintain, is the safest form of aerial sport. Mr. Percival Spencer has offered his experiences of many years in ballooning to the Union.

The Antarctic Explorers

ON February 13, a message was received at Deception Island (to the south of Cape Horn) from Sir Hubert Wilkins stating that he would arrive there on the following day in the ship *William Scoresby*.

Sir Hubert left Deception Island on January 27, and nothing was heard of him until February 11, when a message from the *William Scoresby* was picked up by a whaler.

Meantime Admiral Byrd is encamped in Little America near the Ross Sea. A ship, *Eleanor Bolling* is proceeding from New Zealand to his relief and it is doubtful whether it will reach him before the ice pack freezes solid for the winter.

Lieut. Eielson's Fate

THERE is little doubt now regarding the fate of Lieut. Carl Eielson and his companion, Earl Borland, who crashed in their aeroplane near North Cape, Siberia, last November. The wrecked aeroplane, it will be remembered, was located a little while back, and now the report comes in that Borland's body has been found buried in 5 ft. in snow near the wreckage. Storms interfered with the search for Eielson's body, although his helmet has been found.

New French Air Record

ON February 15-16, at Istres, the French airmen, Costes and Codos, beat the world's records for distance and endurance for aeroplanes carrying a load of 1,000 kg. They remained in the air for 18 hrs. 1 min. and covered 2,034 miles.

Walmsley Memorial Lecture

MR. C. R. FAIREY will deliver the Walmsley Memorial Lecture, on the subject of "Aviation," on February 24, before the Northampton Engineering College Engineering Society, at the College in St. John Street. The lecture will commence at 4.15 p.m., and visitors are cordially invited.

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AIRSHIP ITEMS

Empire Communications

SIR DENNISTOUN BURNEY gave an address on "Empire Communications" at a meeting of the Royal Empire Society, at the Hotel Victoria on Wednesday, February 12. He said that the excellent results obtained from R 100 and R 101 left no doubt as to the feasibility of building an airship with a cruising speed of 90 m.p., with a commercial range of 3,500 miles, and a payload (exclusive of crew and fuel) of 30 to 50 tons at that range and speed. The airship was becoming more efficient with every new construction, and he thought that the next few years would see the solution of all the difficulties which now militated against its commercial use. He said that airships, flying boats and landplanes would not be competing types, but supplementary to each other. With a proper development of air transport, no two ports of the Empire would be more than a week distant from each other. This would make it possible for the Empire to become a single economic and political entity.

Subsidies were still necessary for air transport, and in the future development each State of the British Empire should contribute according to its capacity. Great Britain could save the necessary sum on the cost of the fighting services. In conclusion, he pleaded that a 10 years' scheme should be laid down, with the idea of establishing a daily service between Great Britain and every Dominion. He advocated an annual expenditure of £10,000,000 by Great Britain. The scheme, he said, if properly organised and administered, would soon pay its way as a commercial enterprise.

Lord Thomson on the Cost of Airships

SPEAKING at Cardiff, on February 14, Lord Thomson said that there had been wild exaggerations about the cost of airships. About £2,000,000 had been spent on the whole programme since 1924, and a country such as ours must pay for its research. The R 101 was strong enough to stand any gale, and, given a good skipper and a good crew, he would go out in her in any weather. They knew now that an airship could be built for about £600,000 which could carry 40 passengers and reach India or Montreal in three and a half days. The public would then decide whether airships were a commercial proposition. At any rate, Great Britain had given a lead to the world.

Bedford's Gift to R 101

ON February 26 the Mayor of Bedford (Alderman S. B. Morling) will present a gift of plate to the airship R 101. The gift has been purchased by public subscription at the suggestion of the late Mayor, Alderman Barford. Alderman Barford was Mayor of Bedford six times. On the last day of his last mayoralty, he and Alderman Morling made a flight in R 101, and the next day he proposed the presentation, in which the Corporation concurred. A fortnight later Alderman Barford died in the Council Chamber.

The Loss of the "Italia"

THE Italian Government has now published the full report of the commission which enquired into the loss of the airship *Italia* in the Arctic Sea. General Nobile is criticised for having started the flight in bad weather, for having circled the Pole for an unnecessarily long time, for having caused the crash by faulty manœuvring, and for having landed down wind at 60 m.p.h. The General's conduct in leaving his companions and returning by aeroplane to the base ship is found to be "without any possible justification." The report also states that "General Nobile has shown himself to have limited technical qualities as a pilot and a negative capacity for command." One can only regret that a talented designer should have undertaken the totally alien task of piloting.

THE AUTOGIRO

TWO items of particular interest emerged from the paper on the Autogiro read by Mr. de la Cierva before the Royal Aeronautical Society on February 13. That the autogiro, although inferior to the normal aeroplane as regards maximum L/D, is more efficient than the aeroplane at low speeds and high speeds, and that the lecturer saw no fundamental objections to autogiros of three, four or even five tons weight.

Mr. de la Cierva said that, at the risk of giving the impression of not understanding his own discovery, he had preferred to remain practically silent for years. He was waiting until he had enough experimental evidence to check his theories, and this evidence had not been available until quite recently, double investigations (aerodynamical and mechanical) having been necessary in order to bring the autogiro to its present stage of development, which only represented an intermediate stage.

The autogiros produced lately had no better performance than the equivalent aeroplanes. In fact, they were a little worse in speed and climb. Nevertheless, they were better flying machines because they had a performance of their own: *utility* and *safety*. The lecturer summed up the comparison in performance between existing autogiros and their equivalent aeroplanes as follows: Top speed, five to ten per cent. less. Rate of climb, twenty per cent. less. Angle of climb fifty per cent. more. Minimum horizontal speed, fifty per cent. less. Since the introduction of the deflector tail, the take-off was better than it used to be. The present autogiro could, with proper handling, be landed in perfectly still air with no run at all after touching the ground. In a steep descent (about 45 degrees) the vertical speed was not more than 12 to 13 ft./sec.

Concerning the latest autogiros, the lecturer pointed out the changes and improvements made. The rotary wings were of different shape and construction. Their main characteristics were the smoothness of the skin, the local strength of the skin to prevent deformation under very high unitary loads, and the considerable flexibility of the whole blade in a plane perpendicular to that of rotation. The blades were hinged to a central hub as in the older machines, but a secondary hinge had been added, perpendicular to the first, so as to allow a certain freedom between consecutive blades. Those two articulations gave the maximum freedom which rotary wings could have without becoming unstable with reference to the axis of rotation in horizontal motion. The slipstream of the propeller was deflected upwards by the new type of tail, and on to the rotary blades, which were forced by the deflected slipstream into a flapping movement which, in turn, was transformed by aerodynamic reaction into circular motion. By this means 60-70 per cent. of the flying revolutions of the rotor could be obtained before the machine began to move forward at all.

The aerodynamics of the autogiro were a very complex problem. A considerable number of parameters, both mechanical and aerodynamical, made it awkward to handle from a purely theoretical point of view. On the other hand, the scale effect being very large, wind tunnel experiments were of little use for checking theory. This, added to the extraordinary sensitiveness to changes in certain parameters, such as pitch and profile drag, explained why mathematicians and experimenters had fixed the best L/D ratio somewhere near seven. Some of the machines produced by the lecturer during the experimental development were not much better than that. He took more than one false step. His engineering theories were not of much use to him until he succeeded, in 1928, in finding an analytical method of integrating the frictional losses of energy, when the aerofoil used was the Göttingen 429, which gave the average profile drag in any conditions and for any value of the parameters defining a rotor. The theory completed in this manner had allowed him to produce autogiros with the correct proportions, and he could safely say that the present results checked with amazing accuracy the simple assumptions which formed the basis of his theory.

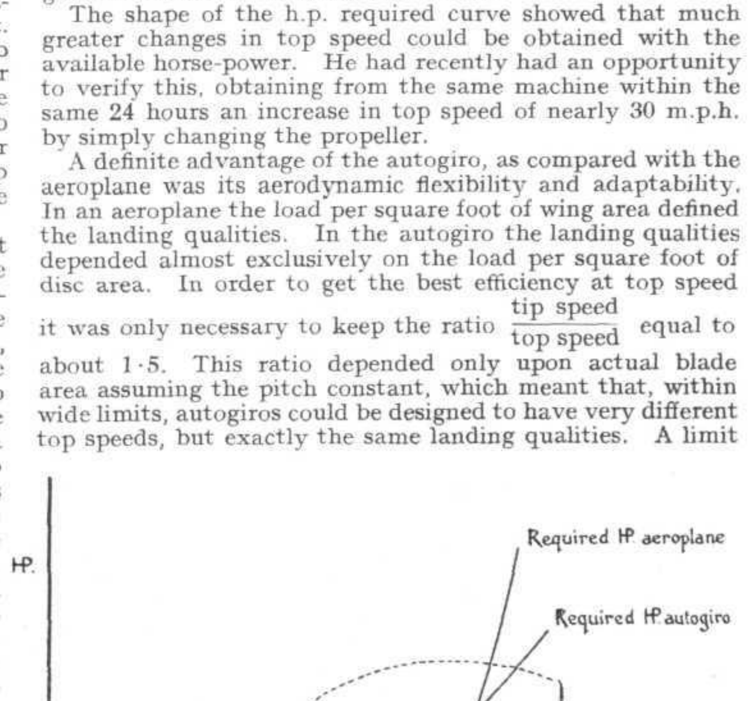
Mention should also be made of the small fixed wing which had been introduced in recent machines to take the place of the aileron beams of the older autogiros. Apart from being a very useful support of the undercarriage and ailerons, this fixed wing improved the aerodynamic efficiency considerably. The action of the wing was double in that not only was its drag less per unit of lift, but it relieved the rotor of part of its load and brought it nearer to optimum incidence, which was very small.

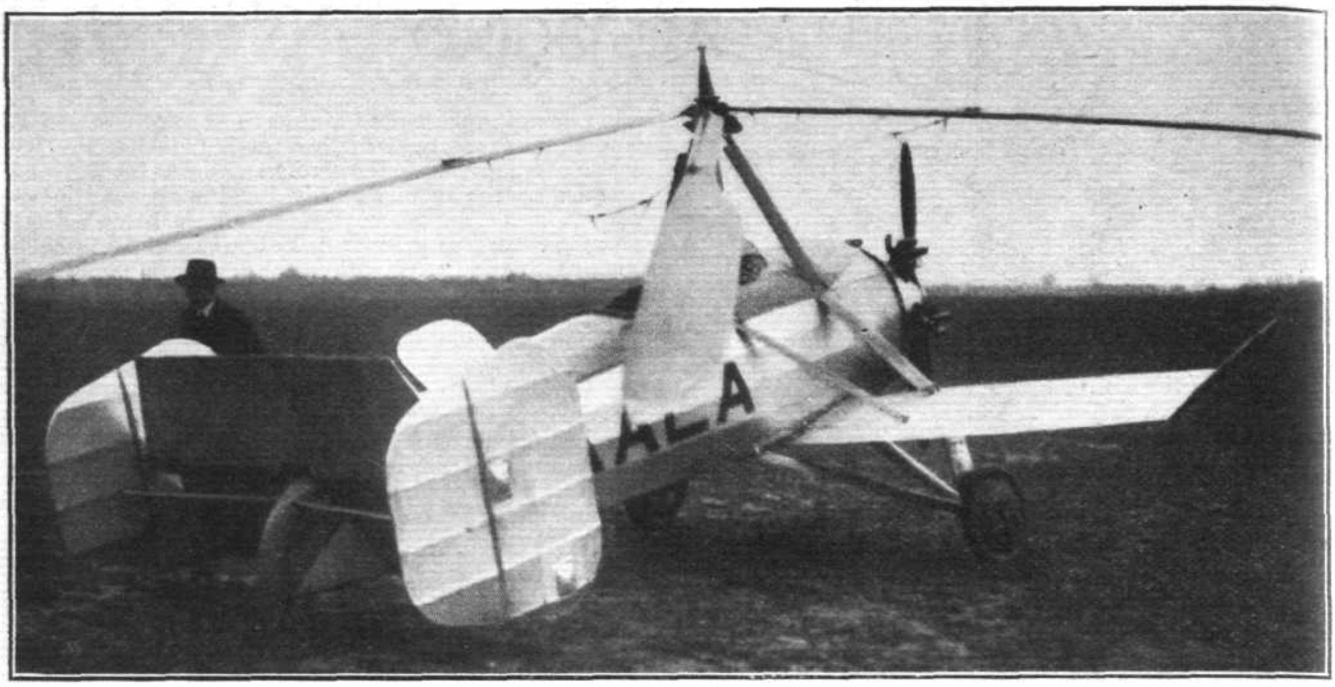
Experimental results obtained in different countries enabled the lecturer to state definitely that he had obtained in practice an L/D of about 12 for rotors combined with small fixed wings, as against an L/D of about 10 for rotor alone. The accurate estimate of lift and thrust coefficients was difficult, but one for the former and two for the latter seemed reliable. These figures referred to rotors of $0 \cdot 1$ solidity.

The autogiro was often claimed to be inferior to the aeroplane, because it had a lower L/D ratio. What really happened was that whereas the aeroplane had its maximum efficiency in the middle range of speed, the autogiro was at its best at the upper and lower ends of its speed range. It could, the lecturer said, be shown that if the diameter of the autogiro equalled the span of the aeroplane, and both machines had the same parasite drag, the induced and parasite power would be the same in both cases, and the h.p. required equations would differ only in the term corresponding to profile drag. In the aeroplane these terms would be proportional to the cube of the speed. In the autogiro they would only be proportional to the speed within wide limits. This proved that the greater the speed the less the difference between the two types, and eventually the autogiro must become the faster of the two.

The shape of the h.p. required curve showed that much greater changes in top speed could be obtained with the available horse-power. He had recently had an opportunity to verify this, obtaining from the same machine within the same 24 hours an increase in top speed of nearly 30 m.p.h. by simply changing the propeller.

A definite advantage of the autogiro, as compared with the aeroplane was its aerodynamic flexibility and adaptability. In an aeroplane the load per square foot of wing area defined the landing qualities. In the autogiro the landing qualities depended almost exclusively on the load per square foot of disc area. In order to get the best efficiency at top speed it was only necessary to keep the ratio $\frac{\text{tip speed}}{\text{top speed}}$ equal to about $1 \cdot 5$. This ratio depended only upon actual blade area assuming the pitch constant, which meant that, within wide limits, autogiros could be designed to have very different top speeds, but exactly the same landing qualities. A limit





THE LATEST AUTOGIRO LIGHT 'PLANE; Note the tail plane tilted to deflect the slip-stream on to the rotor. (FLIGHT *Photo.*)

was reached when the blades became too narrow and thin, but beyond that limit a decrease in pitch angle could still be used to increase the rotational speed, with only a slight decrease in efficiency at lower speeds. He thought it very probable that tip speed to top speed ratios of about one would be used in the future on very fast autogiros. He was satisfied that without diminishing the pitch angle from the optimum it was possible to design autogiros having a top speed of in the neighbourhood of 200 m.p.h., and landing exactly the same as the latest type of autogiro light 'plane.

It was sometimes argued that in an autogiro the true maximum airspeed of the autogiro was the sum of the tip speed and the speed of advance, and that, therefore, the speed of sound would be approached by the fastest element of the autogiro long before any wing element of an aeroplane, with corresponding detriment to efficiency. To that he would answer that the tip speeds of the propellers of the fastest aeroplanes must approach very much the speed of sound without terribly detrimental results. In the equivalent autogiro, speeds of the order of about one-half that of sound, or about 370 m.p.h., could be attained before the speed of sound was approached by the tips. And even then it would only be for the tip of the blades during a few degrees of their azimuthal position.

Very interesting considerations arose in connection with the limit in size. Apart from secondary difficulties, which would probably be overcome more or less easily, the size of an autogiro appeared to be limited by the diminution of the ratio centrifugal force/lift when the dimensions increased homothetically and the weight of each blade was kept proportional to the total weight of the machine. This meant an increase in the coning angle. He had arbitrarily fixed the coning angle at 9½ degrees, a condition in which autogiros had flown without difficulty and without any apparent loss of efficiency. The maximum desirable ratio of total weight to rotor weight was 10. A correctly calculated autogiro with a top speed of 80 m.p.h. ought not to weigh more than 1,000 lbs. gross, while for 100 m.p.h. the weight could be more than 2,500 lbs., and a machine weighing 10,000 lbs. should do more than 140 m.p.h. As the big machines should be proportionally faster than the small machines, for equal power loading, he could see no fundamental objections to three, four or five-ton autogiros.

The last part of the lecture was devoted mainly to a discussion of vertical descent and to the parachutal efficiency of the autogiro. In conclusion, the lecturer said that the autogiro was still susceptible to considerable development and improvement. At the same time, it was already a thoroughly practical machine, and in the very near future it would be, he hoped, a still better one. The secondary development stage had now arrived, when the co-operation of aircraft constructors generally could justifiably be asked, and the scope of the work broadened by the participation in it of the aircraft industry whose constructional knowledge and genius had not hitherto been available.

THE DISCUSSION

THE CHAIRMAN, Col. the Master of Sempill, recalled that since Senor de la Cierva addressed the Royal Aeronautical Society some four years ago, great developments had been made with automatic slots. The lecturer's invention had for its main purpose the avoidance of stalling and spinning, and the question now arose how much greater safety the autogiro offered as compared with the aeroplane fitted with slots. In other words, it might appear that its advantages in the matter of safety were not now quite as great as when the invention was first brought forward. Concerning his personal flying experience with the autogiro, he had to admit that he was amazed. It was difficult for a pilot accustomed to ordinary aeroplanes to become used to gently throttling down the engine, and then to sit quietly admiring the scenery while the machine descended unattended towards the aerodrome. The Director of Civil Aviation, Sir Sefton Brancker was unable to be present, as he had had to go to Greece in connection with certain matters connected with the Mediterranean route of Imperial Airways. He had, however, sent a letter, from which the chairman quoted certain passages. One was to the effect that he (Sir Sefton) was notorious for his bad landings, and that consequently he was delighted with being told, when he recently made a pancake landing from about 30 ft., that that was the correct way to land the autogiro!

MR. WIMPERIS, Director of Scientific Research, said the Air Ministry had done their best to assist Senor de la Cierva, and had had several machines built in order to test whether the full-scale results agreed with those of model tests and with theoretical calculations. All sorts of minor difficulties were likely to crop up when one was doing full-scale tests requiring great accuracy, and so delays were bound to occur. In a general way, however, he thought that it could be said that the practical full-scale tests had agreed with the figures which the lecturer had given in his paper.

Concerning the fact that the autogiro was a little slower in top speed and a little inferior in climb to the aeroplane, one should remember that it had other qualities which no other aircraft possessed, and these had to be paid for in some way. For many purposes it did not seem too high a price to pay for such qualities as ability to land without any run, and so forth. He was constantly being asked the question whether the slotted aeroplane could not do all that the autogiro would do. The question was difficult to answer, and he had hoped that the Guggenheim competition, in which two autogiros and two slotted machines were entered, would have furnished an answer to that question. Unfortunately the autogiros did not take part in the competition, and so the answer was not yet forthcoming. He would like the lecturer to give the reasons for the withdrawal from the competition of the autogiros that had been entered. As regards the future, he thought the greatest immediate prospects for the autogiro was as the private owner's machine. Its ability to land safely on all sorts of bad country should be a great asset.

MR. McKINNON WOOD said that to him it seemed that the paper on the autogiro was mainly a statement of faith on the part of the lecturer. He could not quite agree with Senor de la Cierva in his views as to the possible efficiency of the autogiro. He admitted, however, that he was a bit out of date, as he had no experience of the most recent type, but only of the 1925 type. He was a little surprised that the lecturer had assessed the parachutal coefficient of the autogiro at 2. He had been looking up some results of tests by Eiffel, and they gave, for a circular disc, a coefficient of 0·5. Miss Bradfield had arrived at a coefficient of 0·75 for a cup, and he would have thought that the autogiro coefficient would lie somewhere between the two.

MAJOR MAYO agreed with Mr. Wimperis that it was a pity the autogiros did not take part in the Guggenheim competition. He rather believed that the autogiro had difficulty in doing the flat glide asked for in the rules of the competition, and perhaps that was the reason for its absence.

MR. C. C. WALKER confined himself mainly to a discussion of the lecturer's Fig. 3 (power available and power required curves) and said it was rather difficult to estimate what was the equivalent autogiro. If the span of the aeroplane and the autogiro was the same, induced drag being negligible at top speed, and the fuselage, &c., drag also being the same, one was left with the profile drags, and he could not quite see how the profile drag of the rotor could be smaller than the profile drag of the aeroplane. One point that he would like to have the lecturer's views on, and that was whether there was any likelihood of the rotor blades developing flutter.

MAJOR F. M. GREEN found it difficult to arrive at any definite conclusions from the lecturer's power curves, and pleaded for actual concrete figures being quoted.

DR. HELE SHAW said that when a man had accomplished what he set out to do, he was said to be successful. The lecturer had set out to achieve safe flight and landing without run, and had achieved that. His machine was, therefore, a success. The lecturer had remarked that the second stage in the development had now been reached, the practical stage. He was an inventor himself, and had had a good deal to do with inventions. He could assure them that no invention which was not a sound one ever reached that second stage. It died before reaching it. That also proved the autogiro a success.

MR. FRIER expressed himself as a believer in stiffness, and thought the idea of a fairly large structural part like the rotor moving about over the pilot's head might be distressing.

MR. W. O. MANNING expressed the view that one particular sphere of usefulness had not been mentioned, and that was the autogiro as a seaplane. A sacrifice of a few miles per hour in top speed was not serious, and the ability of the autogiro to take off in a very short run, and to alight almost without any run, should enable an autogiro seaplane to operate under failry bad conditions. For night flying also, he thought the autogiro would have advantages great enough to outweigh the disadvantages in top speed and rate of climb.

CAPTAIN RAWSON, Cierva's test pilot, said that he had had some 1,500 hours' flying on aeroplanes and some 200 hours on the autogiro. After the first ten minutes or so, one never noticed the rotor above one's head.

SENOR DE LA CIERVA did not reply at great length, but promised to do so in writing, for publication in the Society's Journal. Sir Sefton Brancker had asked how the autogiro behaved in a bad bump. Practical experience had shown that all that happened was that the rotor blades lost their coning angle for a few seconds, but resumed it again in a perfectly normal manner as soon as the bump was passed, and nothing was to be feared on that score. The reason for not taking part in the Guggenheim was one that must be familiar to most of those present: Inability to get the machines ready in time. He believed that the flat gliding angle demanded could be attained. Mr. McKinnon Wood had said the paper was mainly a statement of faith. He would point out that faith was a subject about which one could not argue. He was sure his parachutal coefficient of 2 was attainable, although the ordinary autogiro was difficult to keep in a vertical descent because it was designed to avoid this by having the c.g. ahead of the rotor centre. To Mr. Walker he would reply that the explanation of the lower profile drag of the autogiro was that, although the drag coefficient itself was greater than that of an aeroplane wing, the rotor blade area was much smaller, and so the overall profile drag was smaller. There was no fear of the blades developing flutter. Flutter presupposed resonance, and the fact that the rotor blades were working in ever-changing conditions on their way around the circle meant that the conditions necessary for flutter could not exist for more than a fraction of a second or so, and consequently flutter could not develop. They had had, in the earlier types, a good deal of trouble with vibration of the blades, but this was of a quite different character from flutter and had now been entirely cured. Actual performance figures had been asked for. One machine, weighing 2,500 lb. and fitted with a 200 h.p. engine had a measured speed range in horizontal flight of 25-112 m.p.h.

R.A.F. SPORT

Hockey

R.A.F. *v.* ESSEX

On Wednesday, February 5, the Essex Hockey XI beat the Royal Air Force on the Polytechnic ground at Chiswick by 6 goals to 2. L. H. Shelley, an old England international, playing at inside left, scored four goals for Essex in the first half, and L. W. Trimby added another. For the R.A.F., F./O. Bufton scored one goal. In the second half the R.A.F. played much better, especially at half-back, and the R.A.F. did quite as much attacking as their opponents were able to do. In this half each side scored once, E. T. Bailey for Essex and L. A./C. Connell for the R.A.F.

R.A.F. *v.* ARMY

The Army beat the R.A.F. by 3 goals to one at Aldershot, on Wednesday, February 12. There was no score in the first half, as, though the Army was constantly attacking, Corpl. Butler played a very brilliant game in goal. In the second half Lieut. C. W. Cook, the Irish international, scored three goals for the Army, and at the end P./O. Lascelles scored for the R.A.F. Teams :—

Army.—Lieut. W. H. Higgs (R.A.); W./O. A. W. Godfrey (A.E.C.) and Lieut. J. A. Mullington (R.A.S.C.); Lieut. T. H. Ely (K.S.L.I.), Lieut. M. H. Cork (A.E.C.), and Capt. J. D. Fisher (R.A.S.C.); Lieut. W. M. S. Lillie (R.E.), Capt. O. L. Roberts (R.E.), Capt. F. M. Eagar (K.S.L.I.), Lieut. C. W. Cook (A.D.C.), and Lieut. C. B. Fairbanks (Sherwood Foresters).

Royal Air Force.—Corpl. C. Butler (Stanmore); Corpl. L. G. Beeton (Henlow) and Flying Officer W. K. Beisiegel (Donibristle); L. A./C. R. Hobbs (Uxbridge), Sergt. W. C. Maher (Upavon), and Flying Officer H. E. Sales (Bicester); Flying Officer N. M. Jerram (Halton), Pilot Officer D. P. Lascelles (Tangmere), L. A./C. F. Connell (Gosport), Flying Officer S. C. Bufton (Bicester) and Flight-Lieut. H. N. Hampton (Digby).

Athletics

ON Thursday, February 6, the R.A.F. Cadet College, Cranwell, beat Jesus College, Cambridge, in a contest at Cranwell by 19 points to 11.

Fencing

The R.A.F. Fencing Union beat the Royal Navy and Royal Marines Fencing Association at Uxbridge, on Saturday, February 8, by 24 wins to 12.

The results were :—

FOIL

R.A.F.—Sheriff, no defeat; Sergt. Hancock, 1; Corpl. Turner, 2. Total, 3.

R.N. and R.M.—Col.-Sergt. Miller, 1 defeat; Col.-Sergt. Preston, 2; Col.-Sergt. Hunting, 3. Total, 6.

EPEE

R.A.F.—Stubberfield and Bishop, no defeat; Flight-Lieut. G. C. O'Donnell, 2. Total, 2.

R.N. and R.M.—Maj. H. G. Grant and Sergt. Jerrel, 2 defeats each; Sergt. Treling, 3. Total, 7.

SABRE

R.A.F.—Sheriff and Hancock, 1 defeat each; Pilot Officer G. N. E. Tindal-Caryll-Worsley, 2. Total, 4.

R.N. and R.M.—Preston, 1 defeat; Hunting and Treling, 2 each. Total, 5.

BAYONET

R.A.F.—Corpl. Eyles, no defeat; Lance-Aircraftman Richards, 1; Pilot Officer Wood, 2. Total. 3.

R.N. and R.M.—Miller, 1 defeat; Hunting, 2; Lieut. J. H. Phillips, 3. Total, 6.

Rugby Football

MIDDLESEX *v.* R.A.F.

Middlesex beat the Royal Air Force XV at the Old Deer Park, Richmond, on Wednesday, February 12, by 5 goals and 2 tries (31 points) to a goal and a try (8 points). The R.A.F. began attacking at once, and Usmie scored a try which Constantine converted. Then the County established a superiority and scored seven times to one more try by the Airmen.

Association Football

The R.A.F. XI beat the Civil Service at Chiswick on Wednesday, February 12, by one goal to nil. A cold wind blowing across the ground interfered a good deal with the finish of the play on both sides. In better weather the R.A.F. would probably have won by a larger margin. Sergt. Acquaroff scored for the R.A.F. in the first half. The teams were :—

Civil Service.—H. Flint (A.G.D.), goal; H. H. Gower (Ministry of Pensions) and L. F. Goldsmith (G.P.O.), backs; J. Macdonald (Agriculture, Scotland), W. C. Caesar (Savings Bank) (captain), and H. L. Webdale (L.E.D.), half-backs; J. McGee (Ministry of Health), T. W. Hawkins (G.P.O.), A. R. Eagles (Paddington P.O.), J. A. Ruston (P.O. Stores), and H. G. Steele (G.P.O.), forwards.

Royal Air Force.—Aircraftman Chaston (Uxbridge), goal; Corporal Pond (Henlow) and Leading Aircraftman James (Netheravon), backs; Sergeant Trout (North Weald), Corporal Robinson (Henlow), and Aircraftman Armstrong (Eastchurch), half-backs; Flying Officer Sleightholme (Mount Batten), Aircraftman Kelly (Henlow), Leading Aircraftman Vernon (Halton), Sergeant Acquaroff (Worthydown), and Aircraftman Seabright (Tangmere), forwards.

THE ROYAL AIR FORCE

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the R.A.F. are **notified**:—

General Duties Branch

Wing Commanders: I. T. Lloyd, to H.Q., R.A.F., Mediterranean, for Air Staff duties, 17.1.30.. J. C. Quinnell, D.F.C., to H.Q. Iraq Command, for Air Staff duties, 18.1.30. F. G. D. Hards, D.S.C., D.F.C., to R.A.F. Base, Malta, to command, 18.1.30. A. F. A. Hooper, O.B.E., to Home Aircraft Depot, Henlow, for Engineer duties, 27.1.30. F. W. Stent, M.C., to H.Q., Fighting Area, Uxbridge, for Engineer Staff duties, 11.2.30.

Squadron-Leaders: R. V. Goddard, to No. 30 Sqdn., Iraq, 18.1.30. E. D. Davis, to H.Q., Iraq Command, 18.1.30. E. L. Howard-Williams, M.C., to No. 47 Sqdn., Middle East, 21.1.30. V. R. Gibbs, D.S.C., to H.Q., Iraq Command, 21.1.30. W. E. G. Bryant, M.B.E., to No. 54 Sqdn., Hornchurch, 15.1.30. C. L. Scott, D.S.C., to Special Duty List, for duty with Brit. Naval Advisory Staff, Chile, 15.1.30. G. R. A. Deacon, M.C., to H.Q., Inland Area, Stanmore, 26.1.30. F. Fernuhough, M.C., to H.Q., R.A.F., India, 1.1.30. W. H. Dunn, D.S.C., to H.M.S. *Glorious*, 20.1.30. H. B. Russell, A.F.C., to No. 1 Air Defence Group H.Q., 16.1.30.

Flight-Lieutenants: C. R. Steele, D.F.C., to No. 47 Sqdn., Middle East, 21.1.30. C. L. Lea-Cox, to No. 39 Sqdn., India, 21.1.30. A. P. Ledger, M.B.E., to No. 30 Sqdn., Iraq, 18.1.30. L. E. M. Gillman, to No. 84 Sqdn., Iraq, 18.1.30. M. M. Freehill, D.F.C., to No. 55 Sqdn., Iraq, 18.1.30. E. A. Sullock, D.F.C., to Aircraft Depot, Iraq, 18.1.30. H. K. Goode, D.S.O., D.F.C., to Station H.Q., N. Weald, 29.12.29. J. G. Western, M.B.E., to Station Headquarters, Upavon, 19.12.29. A. S. Cheshire, M.B.E., to Armoured Car Wing, Iraq, 13.12.29. F. H. Astle, to R.A.F. Depot, Uxbridge, 5.1.30. J. Bussey, to Air Ministry (A.M.S.R.), 14.1.30. L. G. Harvey, to R.A.F. Depot, Uxbridge, 21.1.30. L. Young, to Home Aircraft Depot, Henlow, 8.1.30. E. A. Healy, to No. 600 Sqdn., Hendon, 1.1.30. H. L. Macro, D.F.C., A.F.C., to H.M.S. *Glorious*, 20.1.30. F. G. S. Mitchell, to H.Q., Coastal Area, 27.1.30. R. H. Barlow, to H.Q., Coastal Area, 22.1.30. C. P. O. Bartlett, D.S.C., to Sch. of Tech. Training (Men), Manston, 15.12.29.

Flying Officers: C. E. V. L'E. Feasey, to R.A.F. Depot, Uxbridge, 3.1.30. A. Lees, to Station H.Q., Duxford, 24.1.30. J. H. Barringer, to R.A.F. Depot, Uxbridge, 19.12.29. F. H. Cashmore, to Aircraft Depot, Iraq, 18.1.30. I. G. E. Dale, to No. 4 Flying Training Sch., Middle East, 18.1.30. J. E. MacCallum, to No. 6 Sqdn., Middle East, 18.1.30. T. L. Harrison, to No. 70 Sqdn., Iraq, 21.1.30. J. H. Brown, to No. 5 Sqdn., India, 21.1.30. G. W. J. Jarrett, to No. 31 Sqdn., India, 21.1.30. R. C. W. Ellison, to No. 5 Sqdn., India, 21.1.30. J. B. Mackenzie, to Station H.Q., Mount Batten, 26.1.30. E. N. V. Everett, to No. 60 Sqdn., India, 1.1.30. J. W. Busteed, to Station H.Q., Hornchurch, 15.1.30. V. S. W. Smyth, to No. 99 Sqdn., Upper Heyford, 23.1.30. J. St. C. Arbuthnott, to Night Flying Flight, Biggin Hill, 10.1.30. R. R. Nash, to Central Flying Sch., Wittering, 18.1.30. G. Bartholomew, to Central Flying Sch., Wittering, 15.1.30. J. Norwood, to Royal Air Force College, Cranwell, 17.1.30. D. M. Harrison, to R.A.F. Depot, Uxbridge, 24.1.30. N. H. Thompson and T. W. Walker, to No. 2 Flying Training Sch., Netheravon, on appointment to Short Service Commns, 14.1.30.

Pilot Officers: L. F. Sinclair, to No. 28 Sqdn., India, 21.1.30. M. G. Parker, to No. 5 Sqdn., India, 21.1.30. G. P. Charles, to No. 31 Sqdn., India, 21.1.30. J. G. W. Weston, to No. 60 Sqdn., India, 21.1.30. D. W. Bayne, to No. 5 Sqdn., India, 21.1.30. D. J. Eayrs, to No. 20 Sqdn., India, 21.1.30. L. V. G. Barrow, to No. 28 Sqdn., India, 21.1.30. D. W. Lane, to No. 20 Sqdn., India, 21.1.30. M. L. Heath, to No. 28 Sqdn., India, 21.1.30. F. W. Stannard, to No. 5 Sqdn., India, 21.1.30. J. T. Stephenson, to No. 4 Flying Training Sch., Middle East, 18.1.30. H. J. Pringle, to No. 4 Flying Training Sch., Middle East, 18.1.30. H. R. Dale, to No. 4 Flying Training Sch., Middle East, 18.1.30. K. P. Lewis, to No. 6 Sqdn., Middle East, 18.1.30. E. J. Finnegan, to No. 54 Sqdn., Hornchurch, 15.1.30. A. Haywood, to No. 60 Sqdn., India, 1.1.30.

Stores Branch

Squadron-Leader E. Meynell, D.C.M., to Aircraft Depot, India, 21.1.30.

Flight-Lieutenants: F. N. Trinder, to H.Q., R.A.F., India, 21.1.30. A. P. Wollett, to Aircraft Depot, Iraq, 18.1.30. F. C. Griffin, to R.A.F. Depot, Uxbridge, 29.12.29. E. C. Farman, to Station H.Q., Hornchurch, 15.1.30.

Flying Officers: H. E. Young, to R.A.F. Depot, Middle East, 18.1.30. L. F. Oldridge, to Aircraft Depot, India, 21.1.30.

Accountant Branch

Squadron-Leaders: A. Holmes, to No. 4 Flying Training Sch., Middle East, 18.1.30. A. W. P. Phillips, O.B.E., to H.Q., Aden Command, 21.1.30. A. R. Thomas, to H.Q., R.A.F., Cranwell, 17.1.30. R. H. Cleverly, to Armament and Gunnery Sch., Eastchurch, 24.1.30.

Flying Officers: J. MacL. Murray, to No. 6 Sqdn., Middle East, 18.1.30. D. Sender, to H.Q., Iraq Command, 21.1.30. T. C. Reep, to Home Aircraft Depot, Henlow, 10.1.30. R. J. Wishlade, to Station H.Q., Hornchurch, 15.1.30.

Pilot Officer C. E. Hunter, to Station H.Q., Andover, 17.1.30.

Medical Branch

Squadron-Leaders: P. C. Livingston, B.A., F.R.C.S. (E.), D.P.H., D.O.M.S. to R.A.F. General Hospital, Iraq, 27.12.29. G. H. H. Maxwell, M.B., Ch.B., to R.A.F. Depot, Uxbridge, 13.1.30.

Flight-Lieutenant P. H. Musgrave (Quartermaster Med.), to R.A.F. Depot, Uxbridge, 7.12.29.

Flying Officer W. J. Cumming, M.B., Ch.B., to Medical Training Depot, Halton, on appointment to a Short Service Commn., 13.1.30.

Royal Air Force College

The Air Ministry announces:—The following Flight Cadets successfully completed, on December 13, 1929, their course of training at the Royal Air Force College. The names are arranged in alphabetical order:—

L. W. C. Bower, E. S. Dru Drury, A. Earle, Winner of Air Ministry Prize for Aeronautical Engineering), G. R. A. Elsmie (winner of Abdy Gerrard Fellowes Memorial Prize, Sword of Honour, and R. M. Groves Memorial Prize), J. Grierson, P. Heath, J. Heber-Percy, G. F. W. Heycock, J. Y. Humphreys, B. H. Jones, W. H. Kyle, E. F. J. L'Estrange, R. V. McIntyre, W. N. McKechnie, W. Sawyer, A. G. Teideman, R. L. Wallace (winner of Air Ministry Prize for Humanistic Subjects), F. F. Wicks.

In addition to the above, the undermentioned Flight Cadet has passed the examination, but will return to the College to complete flying training:—R. T. P. Clarkson.

Vacancies for Royal Air Force Apprentice Clerks

The Air Ministry announces:—Sixty vacancies exist in the Royal Air Force for well-educated boys, between the ages of 15½ and 17, to enter as apprentice clerks; 30 vacancies will be filled in April, and 30 in July. Some of the posts will be filled by means of an open competition, which will be held by the Civil Service Commission in April, at various centres (for entry in July, 1930), and the remainder by direct entry of boys who have obtained an approved school certificate. Successful candidates will be required to complete, in addition to the training period, 12 years' Regular Air Force service, after reaching the age of 18. At the age of 30, they may return to civil life, or may be permitted to re-engage to complete time for pension.

Boys entered under this scheme undergo a two years' course of training in clerical duties, typewriting, shorthand, book-keeping and practical office routine, during which time their general education is continued under a staff of graduate teachers.

The apprentice clerks are paid 1*s.* a day for the first year, and 1*s.* 6*d.* a day afterwards. The subsequent *commencing* rates of pay, varying from 3*s.* to 4*s.* 6*d.* a day (21*s.* to 31*s.* 6*d.* a week), depend upon the degree of success they achieve at their final examination. In addition, they receive free board and lodging.

Detailed information regarding the apprentice clerk scheme can be obtained from the Royal Air Force (Apprentice Clerks' Department), Gwydyr House, Whitehall, S.W.1.

PERSONALS

Married

Flight-Lieut. D. D'Arcy Greig, youngest son of the late Mr. H. R. W. Greig, of Demerra and Elgin, Scotland, and Mrs. Greig, of Draycot, Buckhurst Road, Bexhill, was married on February 1, at St. Barnabas's Church, Bexhill, to Miss Lorna Dean, daughter of the late Rev. C. G. G. Dean and Mrs. Dean, of Bexhill. The bridegroom was attended by Flight-Lieut. Beilby, and the Schneider Trophy team was represented by Flight-Lieut. Atcherley. Flight-Lieut. Greig, who returns to Iraq in March, will be accompanied by his wife.

Wing-Commander Edye Rolleston Manning, D.S.O., M.C., R.A.F., son of the late William Alexander Manning, of Sydney, and of Mrs. Manning, at Dawson Hotel, London, W.2., was married on January 25 in the Chapel of the North Sydney Grammar School, New South Wales, to Phyllis Mary Louise, only daughter of Mr. and Mrs. C. A. Degenhardt, of Killara, N.S. Wales.

Lloyd Whitworth, A.F.C., of Ceylon, son of the late Mr. and Mrs. A. H. Whitworth, of Eccles, was married on January 14 at the Parish Church, Bowdon, to Christine May, daughter of Mr. and Mrs. C. S. Lewis, of West Holme, Bowdon.

Item

The will of the late Flight-Lieutenant John Francis Lawson, R.A.F., of Moreton Terrace, Old Brompton Road, S.W., has been proved at £61.

IMPORTS AND EXPORTS

Aeroplanes, airships, balloons and parts thereof (not shown separately before 1910).

For 1910 and 1911 figures see Flight for January 25, 1912.

For 1912 and 1913, see Flight for January 17, 1914.

For 1914, see Flight for January 15, 1915, and so on yearly, the figures for 1927 being given in Flight, January 19, 1928.

	Imports.		Exports.		Re-exports.	
	1929.	1930.	1929.	1930.	1929.	1930.
	£	£	£	£	£	£
Jan. ..	—	2	74,307	147,935	100	—

AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations: Cyl. = cylinder; i.c. = internal combustion; **m.** = motor.
(The numbers in brackets are those under which the Specifications will be printed and abridged, etc.)

APPLIED FOR IN 1928

Published February 20, 1930

29,715. M. F. Perry. Means for guiding or supporting control cables. (324,319.)

30,566. Dornier Metallbauten Ges., and Dr. C. Dornier. Hollow metallic supports or beams. (303,058.)

32,987. P. M. Staunton. Aircraft. (324,441.)

APPLIED FOR IN 1929.

Published February 20, 1930

2,280. G. Dhainaut and M. Fauveliere. Hub for aeroplane wheels. (305,134.)

8,362. H. Junkers. Means for driving charging-pumps of i.c. engines. (308, 258.)

12,773. E. M. G. Lepere. Mounting radiators in aeroplane wings. (313,150.)

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12 „	30 4	12 „	$8.24	12 „	33 0

* *Foreign subscriptions must be remitted in British currency.*

Cheques and Post Office Orders should be made payable to the Proprietors of "Flight," 36, Great Queen Street, Kingsway, W.C.2, *and crossed Westminster Bank.*